POPULAR MECHANICS

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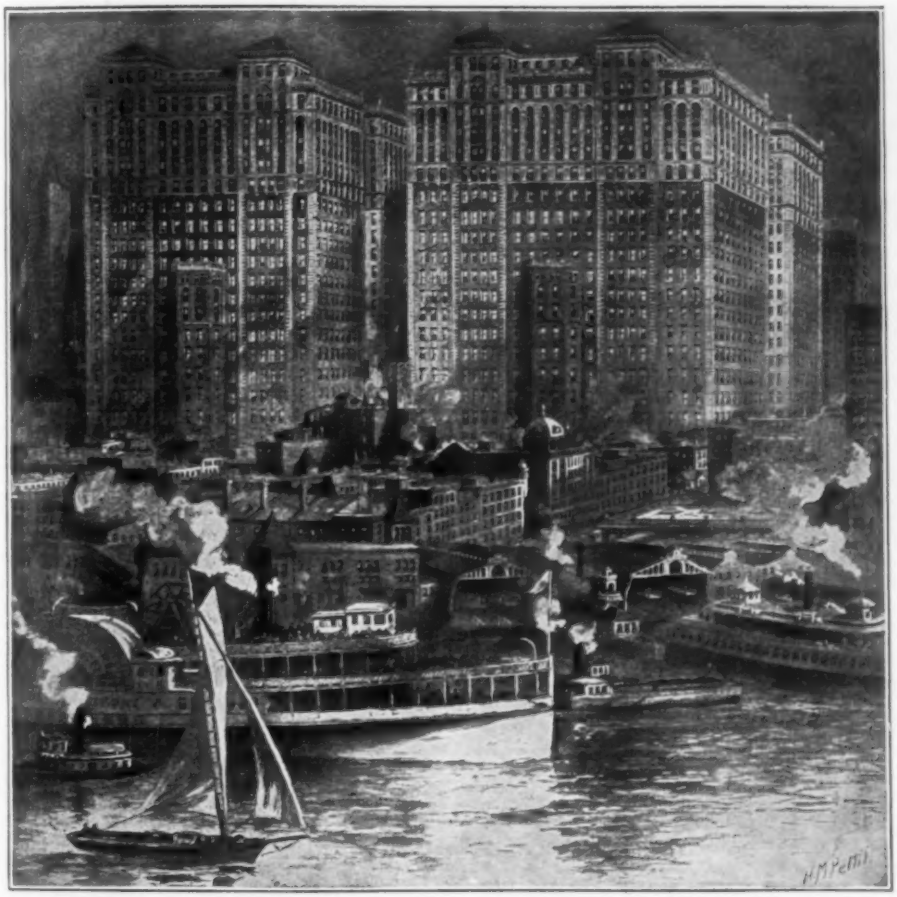
LARGEST BUILDING IN THE WORLD



The largest and most wonderful building in the world is the terminal building of the Hudson and Manhattan Railway Company in New York. It is 22 stories high, occupies the halves of two blocks fronting on Church street which is parallel with Broadway and the next street toward the river, and extends from Cortlandt to Fulton streets on both sides of Dey street, which is crossed by a bridge. It covers 75,000 sq. ft. on the ground and includes 18,150,000 sq. ft. of floor space, equivalent to 27 acres.

The gigantic structure stands over a cofferdam, a waterproof pit 420 by 180 ft. in size and 75 ft. deep, inclosed in concrete walls 75 ft. thick, which extend down to solid rock 95 ft. below the street level. This pit is a railway sta-

tion and receives the railways that run through the tunnels to Jersey City and bring into New York the trains of the Pennsylvania, the Erie and the Lackawanna railroads, the passengers from the steamships landing in Hoboken and Jersey City and the commuters who live along 500 miles of trolley railways in northern New Jersey.

The first floor under the surface contains the waiting rooms, including a concourse of 75,000 sq. ft., where the passengers buy their tickets, check their baggage and are distributed to the different lines. Surrounding this enormous room is a department store where passengers and suburbanites will be able to do their marketing and shopping without going out of doors. There are telegraph offices, barber shops, news stands, fruit and flower booths, confectionery shops, a government postoffice, restaurants and cafes, telephone booths, a barroom, a parcel room, cigar stores, offices where railway and steamship tickets to all parts of the world can be bought, and shops for the sale of all the necessities of life.

It is the only building in the world in which space has been rented by the acre. The Erie Railway Company has taken two acres of floor space, the United States Steel Corporation has taken one and one-half acres, the United States government has rented an acre for a branch postoffice, and the American Locomotive Company and the General Electric Company have each taken a half acre.

The highest rental ever paid for business purposes in the world is received from the cigar trust for a room 19 by 22 ft. in size at the corner of Church and Cortlandt streets on the ground floor adjoining the main entrance to the building. The rental is $18,000 a year, or $40 per square foot.

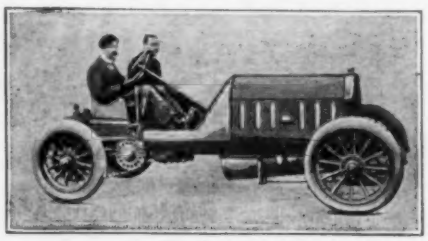
There are 4,200 rooms in the building, with more than 5,000 windows and 5,200 doors, of which 3,000 have panels of ground glass.

Sixteen million bricks, 75,000,000 lb. of concrete and 25,000 tons of steel have been consumed in its construction. Nearly 125 miles of picture rail was tacked on the walls of the rooms, 113 miles of electric wiring was laid and 30,000 electric light bulbs placed on 6,000 electroliers and 7,000 brackets, and even these figures will be enlarged.

There are 16 miles of plumbing, 29 miles of steam heating pipe and 95 miles of conduit. There are 39 elevators, and one round trip in all of them from the lowest basement to the top story represents a journey of 3½ miles.

It is estimated that 10,000 persons will be lodged under the roof when every office is taken, and that over half a million people will enter it every day. The force of employes, including engineers, firemen, electricians, elevator boys and janitors, will number 150.

Aside from the regular receipts from rentals, the company will derive an enormous revenue from special privileges. The advertising space in the building and cars was leased for $200,000 a year, the cigar privilege for $33,600 a year, the bar for $25,000 a year, the soda water privilege for $19,000 and the bootblack privilege for $11,000. The building and land cost $15,000,000.



AUTOMOBILE RUNS TWO MILES A MINUTE

In a recent race on the famous Brooklands track in England a 4-cylinder car driven by Felice Nazzarro broke all speed records, averaging 94¾ miles an hour for 27½ miles, and accomplishing an officially recorded speed of 121.6 miles an hour for 2¾ miles. Although built to come within the 90-hp. standard, the car develops an actual horsepower of 157.

PETRIFIED FISH AS MONUMENT

This extraordinary petrified fish was erected in Wurtemberg, Germany, as a

A Petrified Monument

memorial to William I, German Emperor and King of Prussia. It is 12 ft. long without its head, and the diameter of its throat is 6½ ft. It dates from prehistoric times, but its head, if also petrified, has not yet been discovered.

OIL FUEL IN BRITISH NAVY

The British navy has in service a large number of oil-using torpedo boats which have a speed of 38 miles an hour, and the use of oil-fuel is being extended as rapidly as possible. Experiments are being continually conducted and a number of storage tanks are being erected in various parts of the United Kingdom to insure convenient sources of supply.

The advantage of oil as fuel reduces the number of stokers by about two-thirds and enables those in the fireroom to maintain steam more efficiently than with coal fires. Also, when speed is reduced the boilers are under such perfect control that the safety valves are seldom seen emitting escaping steam. One of the greatest advantages of oil is the absence of a great volume of black smoke, which betrays location to an enemy The evaporative value of oil is also much greater than that of coal, so that while 45 cu. ft. of bunker space is required for a ton of coal, only 38 cu. ft. is needed for a ton of oil.

A FASHIONABLE AFRICAN

This Central African potentate is a keen follower of the latest styles, as his photograph bears witness. In his own estimation, his most important possession is the spectacles with bead frames. There is no glass to the spectacles, which are obviously worn as an aid to beauty, in the belief that the white man wears them as such, not because of

"Spectacles" Without Glass

necessity. His other ornaments are a fillet, earrings, collar, and a bolero of beads.

A Traveling Mexican Kitchen

MEXICAN SQUAWS PREPARING A MEAL

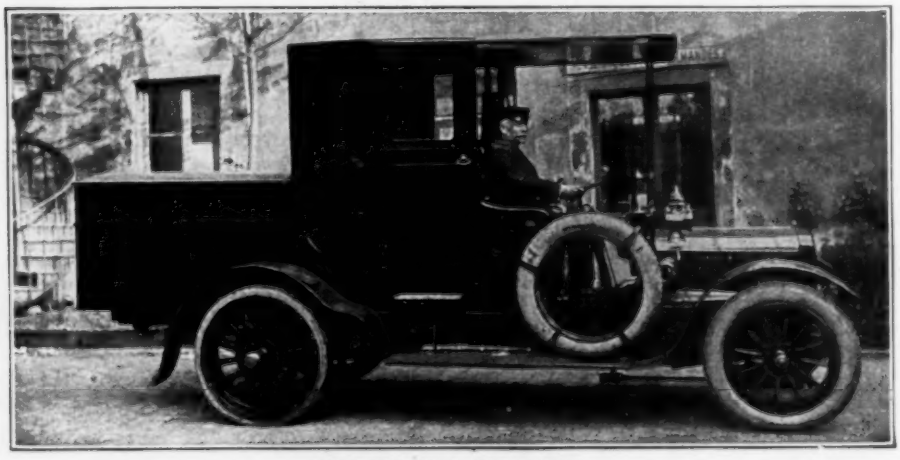
The squaws of the Mexican Indian tribes cook in the large clay utensils shown in the illustration. The spokes and hub of the wheel of the Indian cart in the background are made of a solid piece of oak.

PARIS AUTOMOBILE HEARSE

A new type of automobile hearse has been so arranged by a Paris undertaker that the coffin is stored in the rear part of the automobile, while the mourners are seated on the seats provided above and can thus accompany the body. The car is 24 hp. and has a speed of from 30 to 35 miles per hour. This automobile is supposed to take the place of the complicated transportation of coffins by railroad and can be used for the long distances.

The fanatic sportsman can therefore in the future be buried at a speed of 25 miles per hour.

England still has 114 miles of street railway operated by horses.

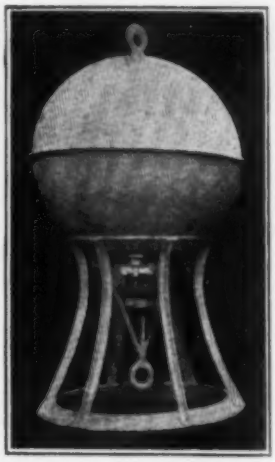


Latest Style Paris Motor Hearse

SUBMARINE MINES

A submarine mine is purely defensive, and consists of a case containing a charge of explosive and appliances for firing it, fixed in position beneath the surface of the water. Mines classified as mechanical, have all the firing apparatus in the case and when planted are dangerous to friend and foe, as they will fire when struck by a passing vessel. Once planted, there is no indication of their whereabouts or condition, therefore their employment is a question of expediency. That they are wonderfully effective in destroying both friend and foe was shown by the experience of the Russians in the late war.

The Explosion



Courtesy Journal U. S. Artillery

Electric Mines

Electrical mines are classified as controllable and non-controllable. Those of the former class may be rendered dangerous or inert at the will of an operator on the shore, and may be tested at any time. The non-controllable electrical mines are fired by means of a firing battery which is thrown overboard after the planting vessel has drawn off to a safe distance. The mine is then to all intents and purposes a mechanical one and the use of the electrical firing battery has resulted solely from the danger incident to planting the latter.

The two favored methods used for firing mechanical mines are as follows: A glass tube containing sulphuric acid is placed so that it will be broken by the jar when the mine is struck and allow the acid to come in contact with potassium chlorate. The heat of reaction causes the explosion of the charge. The second method is an arrangement of pistol and ball so that the ball will be thrown against the pistol trigger when the mine is struck and cause a shot to be fired into the charge, exploding it.

The explosives used in submarine mines are black powder, dynamite, and

wet guncotton. Of these the last two are the most effective. In selecting explosives the three greatest requirements are: retention of normal strength under the conditions incident to the service, to-wit: lapse of time, alternate freezing and thawing, occasional wetting and even saturation with water; convenience in loading—involving safety in transportation and handling with ordinary roughness—a form which admits of ready insertion in a hole small enough to be rendered watertight, and a high density in small bulk; and the greatest possible effect when fired under water in such envelopes as are suitable for submarine mines.

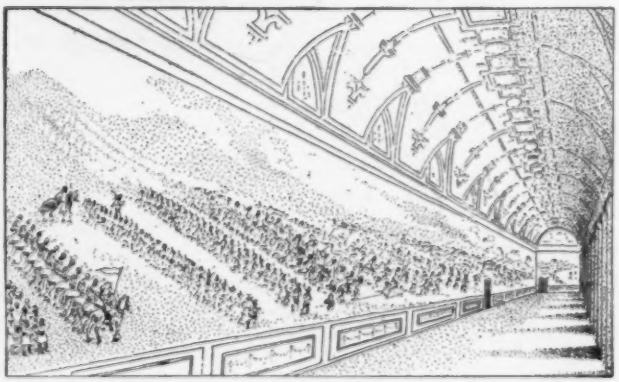
In constructing a mine, metallic cases are universally used. They are spherical, cylindro-spherical and conical in shape. The first type is best under ordinary conditions as it exposes the same surface to the tide currents, gives great buoyancy and is easy to handle. The case may be made in a single piece, the hemispheres being pressed and then welded along the equator, or it may be in two pieces and prepared for service by placing a rubber gasket between the hemispheres and clamping on the equatorial lip. The corrugated cylinder case, shown in one of the illustrations, is the latest type, and is generally used where currents are swift. The corrugated material diminishes the weight materially.

Some recent experiments have been made with a view to determining the character of subaqueous explosion and the results have been very interesting. They demonstrated that there are two phases to such explosions, in the nature of wave motion and pressure. The former acts first and extends a great distance, the latter exerts pressure due to displacement of the material, but does not extend a great distance from the mine. The former depends upon the rate of detonation and amount of gas; the latter upon the volume of gases, temperature of explosion and density of charging. It has been noticed by observers at some distance from an exploding mine that the fish jump from the water before any sound is heard or eruption noticed. The arrival of the percussive wave is very noticeable on a large vessel several hundred yards from the explosion, and firemen often are very uncomfortable on mine planters even though the vessel may be more than 1,000 yd. away when the mine is fired.

According to Major R. P. Davis, of the coast artillery corps, the cost of mine defense is a mere bagatelle when compared with that of any other. The entire material to protect all harbors of a country like the United States would cost but little more than $4,000,000, which is less than the cost of one first-class battleship.

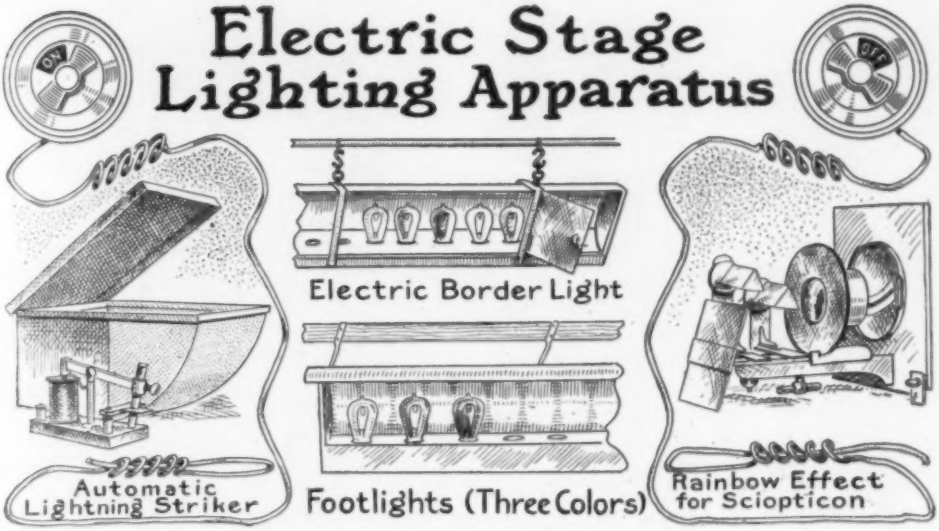
GALLERY IN LARGEST PALACE IN THE WORLD

The "Escurial" palace, in which the Spanish kings are buried, is the largest in the world. It is claimed that it takes four days to make a tour of all the rooms, and that the distance to be covered is about 120 miles. The illustration shows the gallery of battle. The castle was built during the reign of Philip II. It is constructed of gray granite of gridiron shape.



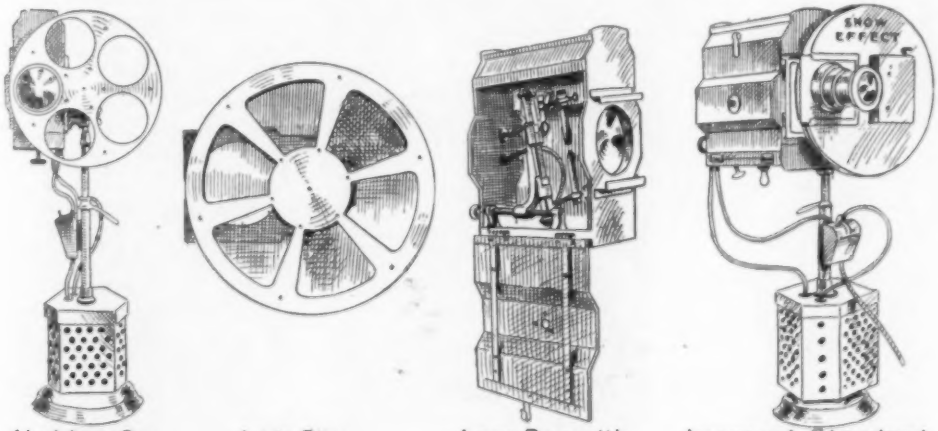
Battle Scene—Figures Life Size

Electric Stage Lighting Apparatus



The statement that Edison, more than any other man or men, is responsible for the modern drama and all other classes of theatrical production, is well borne out by these illustrations of electric stage lighting apparatus. The wonderful and realistic stage settings of today can be traced back to the shop of the electric wizard as surely as warmth can be traced to the sun.

Starting with electric footlights, which in their early days were considered wonderful, the art of stage lighting has progressed until now the stage can be deluged with sunshine or moonlight and innumerable other effects. Take, for instance, the Metropolitan Opera House in New York. Its switchboard is located directly underneath the center of the stage floor and controls 11,488 16-cp. lamps, besides motors, 44 arc pockets and 228 incandescent stage pockets. The main switchboard is provided with two master switches for each color of light on the stage, so by operating one switch the lights of one color on one half of the stage can be shut off without affecting the same color on the other side. This enables the operator to darken one side while

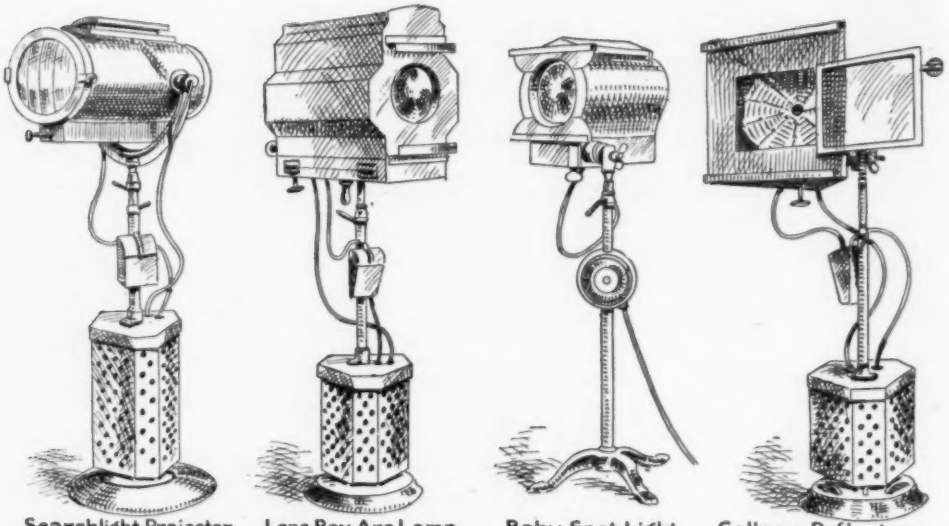


6 inch Lens Box and Color Wheel

Lens Box Color Wheel

Lens Box with Open Door

Improved Standard Arc Sciopticon



Searchlight Projector | Lens Box Arc Lamp | Baby Spot Light | Gallery Reflector

sunshine or moonlight is flooding the other side.

Among the different lights used in stage scenes are foot-lights, border-lights, color wheels and plates, movable spot-lights on the stage or in the balconies, stage searchlights, automatic lightning strikers and arc sciopticons. With the latter are attachments for snow effects, rainbows, ocean waves, running water, tidal waves, moving clouds with disappearing moon, cyclones, burning forests, flying butterflies and birds, live snake and animal effects and countless others just as wonderful.

INOCULATING NATIVES AT BANGALORE

The Event is Made a Gala Day

The inoculation of natives against the plague at Bangalore has become more of a social event than something to be dreaded and feared.

The natives do not like pain of the kind made by the instruments of the English Sahibs, but they love music and things to eat. Therefore, a magnificent inoculating pavilion has been erected by the municipality of Bangalore.

The important natives of the town gather there, the Indian band dispenses

sweet music, attendants dispense sweet cakes and fruits, and the physicians operate to their hearts' content.

CANALS SEEN ON MARS MAY BE ONLY VEGETATION

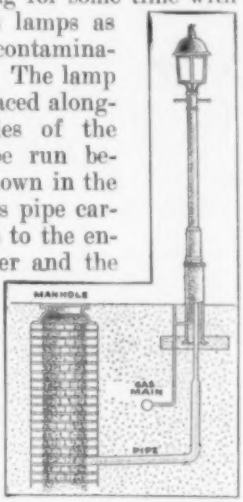
One of the theories of Prof. Lowell, one of the greatest of American astronomers, is that the canals of Mars, as we see them, are not the actual water canals, but the broad bands of vegetation on their margins. This may be aptly illustrated by growth phenomena on the earth, and a curious instance is found on a hill in the Azores. Upon it grow narrow strips of a bush known as the urze, and at a little distance these appear not unlike the Martian canals.

At a Distance These Lines of Vegetation Look Like Canals

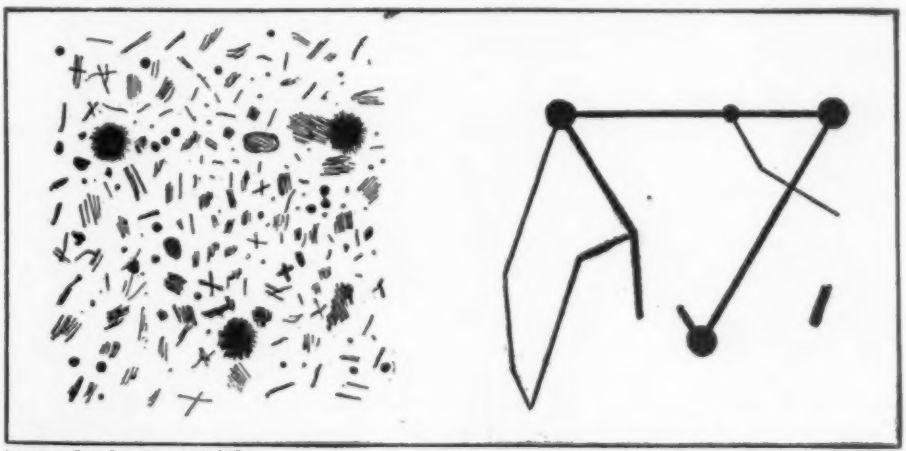
The two diagrams here shown support the theory that the canals need not be artificial, if they do exist, and that their regular lines, which give them their artificial appearance, may be an optical illusion. One of the diagrams shows a number of irregular markings. The second shows the appearance of the first when viewed at a distance of 30 ft. Try it yourself.

SEWER AIR DISINFECTED BY GAS LAMPS

The Canadian city of Winnipeg has been experimenting for some time with ordinary city gas lamps as destroyers of the contamination in sewer gas. The lamp standards were placed alongside the manholes of the sewer and a pipe run between them, as shown in the illustration. This pipe carries the sewer gas to the enveloped gas burner and the flame effectively burns and disinfects it as it passes through.



To prove the effectiveness of the system plates containing culture-media of blood-serum, agar and gelatine were exposed to the sewer gas both before and after it had passed through the lamp. Not a single growth of bacteria was found on the plates exposed to the sewer



Courtesy London Illustrated News

When Viewed at a Distance of 30 Ft. or Less, the Spots at the Left Assume the Positive Lines Shown at the Right

air after it had passed through the lamp, but from the plates exposed to the same gas before passing through were obtained 302 germs.

CONCRETE TREE CHIMNEY IN GROVE

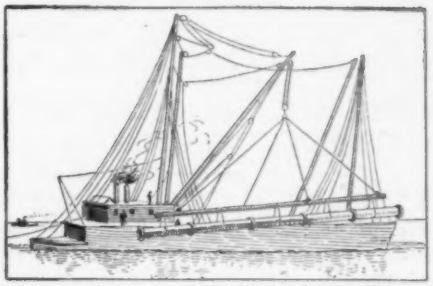
Concrete has been supplanting wood for a number of years, but this is probably the first instance where timber

Courtesy Cement Age

Closely Resembles a Tree

has been reproduced in its original form in concrete. What appears to be an old monarch of the forest is in reality a reinforced concrete chimney for an electric plant on the estate of Edward Tuck at Verte Monte, Malmaison, France.

It is the result of an artistic temperament forced to erect a stack of some kind among the trees and reluctant to mar the harmony of the scene by one of ordinary design. The arched door at the base of the concrete tree is indicated by a delicate line.



Courtesy Engineering News

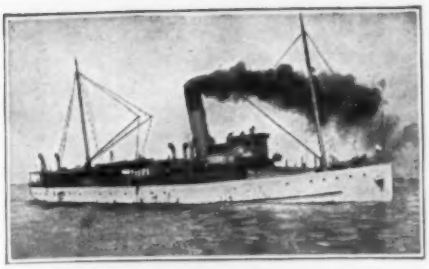
LOWERING 84-FOOT SECTIONS OF PIPE UNDER WATER

The outfit shown in this illustration was used in lowering the 84-ft. sections of cast-iron pipe of the submerged sewerage force main for tide-water outfall at Salem, Mass.

The pipe was loaded onto the lighter, and the seven lengths composing each section put together on the deck, the joints being run and calked. A 15-in. I-beam 75 ft. in length, trussed laterally to prevent bending, was suspended from the block on the derrick boom by four strands of wire rope, spaced evenly on the beam, and to this the section of pipe was strapped with ½-in. wire ropes, two straps to each length, except the end lengths, which were held by one strap. The straps were connected at one end by shackles, with the pins so placed that they could be easily removed by the divers, and the straps released after the pipe was in position.

The I-beam, with a section of pipe, weighed about 15 tons. The pipe, after being lowered into the trench, was blocked up to the required grade and held in position by wedges. The lighter was so placed and the guy on the derrick boom so arranged that when the pipe was in position the whole weight was brought to bear and pushed the sections together the moment the guy rope was slackened.

A subscriber of the telephone system of Grand Meadow, Minn., pays his telephone rental every 3 months, but for 13 months did not use it once or receive a call, although at home all the time.

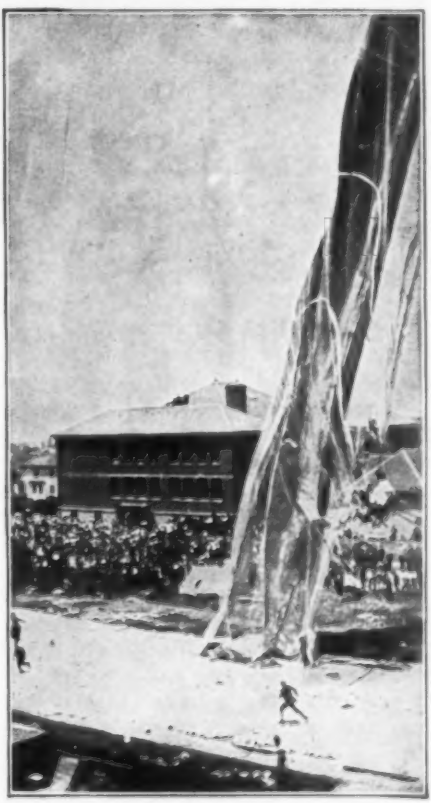


SANDSUCKERS REPLACING DIPPER DREDGES

Built in the nature of an experiment the government dredges, or sandsuckers, as they are called, are rapidly filling the place of the dipper dredges on the great lakes. They have been used on the Atlantic coast a short time and the first one to be used on the great lakes is now operating on the west shore of lake Michigan. The "General Gillespie" excited considerable interest in marine circles as it was thought that it would not do the work that the old style dipper dredges had done, but after being in use in clearing harbors of accumulated sand it was found that it was much more satisfactory and could be operated at less than one-fifth the expense of the old style. The "Gillespie" is a powerful dredge, although it looks more like a steamer than a dredge. As a matter of fact it is a boat which cruises up and down the coast under its own power. Two great pipes drag along the bottom on each side, powerful pumps sucking the sand and water into the hold of the vessel where the water runs off and the sand is carried out into the lake and dumped by means of trap doors in the bottom of the steamer. This does away with tugs and scows and a greater amount of work can be done in a day than with the old style dipper dredges. The power of the dredge is shown by the fact that while dredging in the harbor at Ludington, Mich., the sandsucker drew a rock weighing 100 lb. into one of the pipes. The cost of dredging with the "Gillespie" is about 8 cents per square yard as against 17 cents with the dipper dredges.

OLD FABRIC CAUSED AIRSHIP WRECK

It is now believed that the cause of the wreck of the Morrell mammoth airship at Oakland was some poor material used in the bag. In order to save on material a quantity of old cloth formerly used in a smaller balloon was sewed in with the new. A case of new wine in old bottles. When the strain came, as the weight was borne by the bag, the weak portion was cut through by a guy rope supporting the second engine. When once the rip started there was no checking it. The illustration from a hitherto unpublished photograph shows the first engine on the ground and the second engine with its operators coming down. The rupture of the bag is clearly shown, and a close examination reveals people and objects



The Rupture Shows Clearly

on the ground beyond, that can be seen through the V-shaped opening like a directoire gown on a large scale.

MODERN USES FOR OLD-TIME CANNON

The scriptural prophecy about swords being beaten into plowshares and spears into pruning hooks is being carried out, almost literally, in a Philadelphia foundry and machine works, where cannon that in their day were considered to be the most formidable weapons in the world are being converted into cooking utensils, gas and water pipe, piano wire, needles and pins, steel pens and even tin roofs for houses.

Discarded Cannon Ready for the Foundry

Almost every cannon the nation has built since the Civil War has been cast of high-grade steel. On being replaced at the coast defenses by more modern weapons they have been offered for sale by the government, and many of them have found their way to Philadelphia to be broken up and the metal used for more peaceful purposes. Weighing all the way from 15,000 to 50,000 lb., on their arrival at the foundry they are broken up into pieces weighing a ton or two and are remelted in huge furnaces, together with proper quantities of other high-grade charcoal iron.

From the furnace the metal is cast into bars or rolls, which either are again cast into the forms desired or rolled into sheets, from which cooking utensils or other sheet metal articles are made, or which form the basis for roofing tin. The metal also is used for structural iron, and many a person who crosses a bridge or enters a skyscraper is making a new use of some old dogs of war. Wires for electric currents also are made from the gun metal.

CABLE-TRANSPORT TRUCK

A special truck for the ordinary transportation of heavy cable drums through streets, has recently been patented in Germany. For places with uneven roads the truck is drawn by horses, but on smooth pavements the hauling is done by men.

The frame of the truck is horse-shoe shaped, the open end of which can be closed with a special cross-bar. The

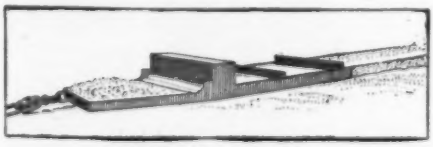
A German Idea

front wheel is of smaller diameter than the two rear wheels, and can be swung around by means of a pole. The truck has no bottom and the drum is held in suspension by two vertical posts. Each post consists of two parts, through which are a number of holes into which bolts are placed. By using these bolts as supports and working the levers shown in the illustration the drum can be lifted inch by inch until it is clear from the pavement. Owing to the length of the levers, which can be made even longer by steel tubes, but little lifting power is required. One man at each end of a lever, and a third to change the bolts in the hole are all that are required. Fastened to the frame below the posts are pulleys which prevent contact of the drum with the frame, so that the drum can rotate while on the truck without friction.

LAYING CEMENT SIDEWALKS BY MACHINE

A machine, consisting of a traveling mold and of a winch for pulling it along, is now being used in constructing cement sidewalks. The concrete for the base of the sidewalk is shoveled or dumped into the front part of the mold, and the finishing mortar is fed into the hopper in the middle. This hopper is so designed that it feeds a thin layer of mortar onto the concrete base as the mold travels forward. Thus a complete and perfect sidewalk is delivered at the rear end of the machine.

With a properly organized gang, the mold is kept traveling continuously at the rate of 2 ft. per minute. The shape of the mold is such that the concrete is squeezed both laterally and vertically into a dense block, which requires no ramming. The finish is claimed to be perfect.



Cement Walk Machine

FRENCH MOTOR SCOUTS CARRY FAN SIGNS

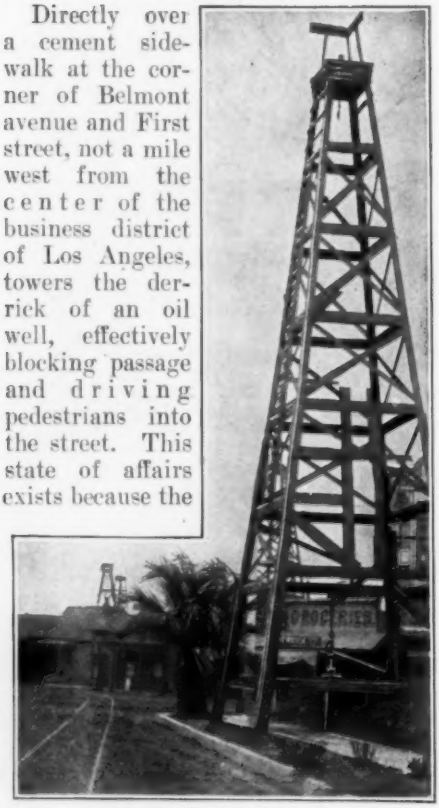
The French automobile club has a service of scouts whose business it is to warn motorists when they are infringing the law or are in danger of doing so. One of the scouts is here shown with his fan-shaped signs. The one which displays the word "Ralentir" is the signal for slower speed. "Fumee" is a warning that the automobile is emitting too much smoke or smell. "Lanterne" is the signal that reminds the automobile driver that it is time to light his lamps. The signs fold up like a fan and are carried in a leather holder attached to the bicycle.

The use of muslin windows instead of glass in dairy construction is said to help materially in the fight against tuberculosis.

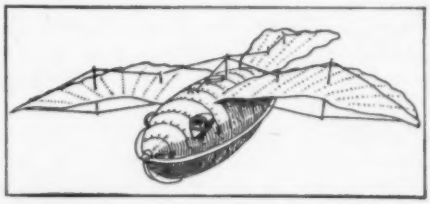
A Russian inventor has arrived in America to exhibit a motor boat which he claims can run 31 miles an hour with a 12-hp. engine.

OIL DERRICK OVER CITY SIDEWALKS

Directly over a cement sidewalk at the corner of Belmont avenue and First street, not a mile west from the center of the business district of Los Angeles, towers the derrick of an oil well, effectively blocking passage and driving pedestrians into the street. This state of affairs exists because the city was given the deed to the strip of land on condition that the well would not be disturbed until the lease covering it expires. The well, which is in continual operation, will therefore obstruct the sidewalk for about five years longer.



Oil Well in Street

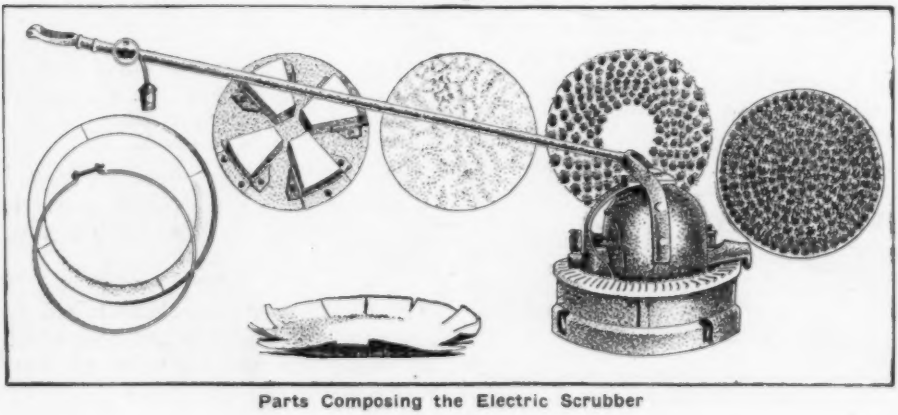


AIRSHIP SHAPED LIKE A BIRD

This heavier-than-air flying machine, invented by a German, is shaped as nearly like a bird as possible, and from end to end measures 27 ft. The tail measures 14 ft., and is used as a steering rudder. The wings extend 27 ft. out from the body and have a spread of 54 ft. Motive power is furnished by a 60-hp. engine.

ELECTRIC SCRUBBING BRUSH

One of the latest and most interesting of the many electric household utensils is a machine which scrubs, sandpapers, waxes, or polishes any kind of floor. It is claimed that the palmetto scrubbing brush does the work cleanly and rapidly, and that it is as effective in the corners as in the middle of the floor. The adjustable parts include, in addition to the



Parts Composing the Electric Scrubber

palmetto scrubbing brush, a steel wire brush, carborundum stones and holder, a sheep's fleece polishing pad, and carborundum paper cut ready to use. The power cost is claimed to be no more than one cent an hour. Current is taken from any electric light fixture in the room.

NEW SENSATIONS FOR SUMMER PARKS

Merry-go-rounds, Ferris wheels and scenic railways, while still well patronized at the summer pleasure parks in the suburbs of the big cities, are growing to be back numbers, for the city dweller who is a regular frequenter of such breathing spots demands something new each season, and to gratify his desire the brains of many an inventor are kept working overtime. This year has seen many real novelties in the amusement line, one of the most popular of which is the "Tickler."

This is a device in which huge tubs, each holding half a dozen persons, slide down an inclined plane, guided by fences which turn and twist the tubs continually during their descent, perfectly safe but guaranteed to make the veriest strangers acquaintances during the brief journey and ruinous to coiffures. The "Tickler" is an avowed enemy of indigestion and a searcher out of the torpid liver. There are but four of them in the country, at Philadelphia, Coney Island, Atlantic City, and Chicago.

In wandering through the "Red Mill" a victim first walks in darkness over what seems to be a soft, wet meadow, then finds himself upon a bridge over a running stream, which either sinks beneath his feet or swings sideways to make him seize a rail, which immediately gives way. An attendant, however, is ready to prevent him taking an involuntary bath. At another point on his journey he is assailed by a hurricane of wind, which either hurls him against a wall or, coming from below, toward the ceiling. About the time he is wondering if his troubles are not nearly at an end his feet slip from under him and he slides down an incline to the point market "Exit."

The "Tickler" Is the Latest

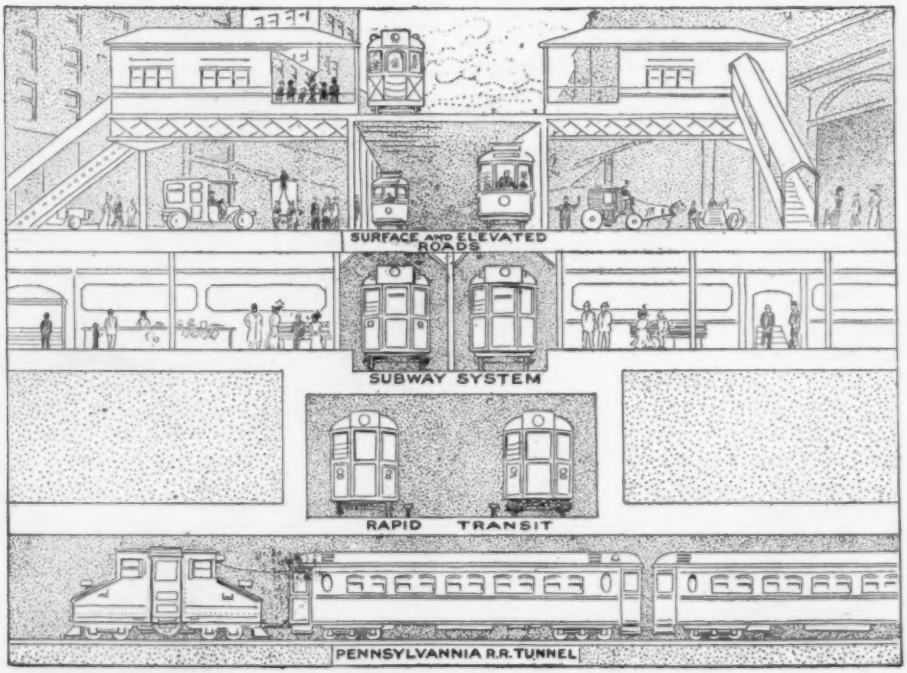
It is expected that over 5,600 tons of dynamite will be used on the Panama canal work during the next fiscal year.

BEES SWARM ON TROLLEY WIRE

A swarm of bees recently attempted to make their home on the overhead wire of an electric street car line at one of the busiest corners in Los Angeles. Many were crushed by passing cars, but the others clung determinedly to the electrically charged wire until shaken into a box by a man with a "big stick."

Queer Place to Swarm

FIVE LEVELS OF TRANSPORTATION



Three Stories of Transportation Line Are Under Ground

No better example can be given of the advancement of transportation facilities in the great centers of population of the world than this illustration of a cross section of New York at the junction of Broadway, Sixth avenue and Thirty-fourth street. As civilization has advanced and the great cities become more and more congested the problem of transportation has presented greater difficulties. Elevation was first resorted to, but soon became ineffectual. Burrowing underneath, as Paris, years ago, was honey-combed by its great sewerage system, was the only relief possible, and now the construction of subways is progressing in more than one great world metropolis.

All the lines shown in this illustration are built or building except the one marked "subway system." This is under construction, but does not, at present, exist under Sixth avenue. The Hudson river tunnel extension is marked "rapid transit."

SUGGESTIONS FOR THE SEA-SICK

There is no specific remedy for seasickness, and the thing to strive for is immunity, which is only relative after all, since the hardiest sailor is liable to succumb to an unusual stress of weather. Seasick victims, according to Dr. C. S. Butler, U. S. N., are divided into three classes—those who have slight nausea that rapidly wears off; those having more persistent symptoms who ultimately acquire immunity, and those who never become used to the oscillation of a ship.

For those in the second class, by far the large majority, is recommended careful dieting and abstinence from alcohol, coffee, tea, and tobacco before

sailing. Sleep during the day on shipboard should be discouraged, as it interferes with the regular sleeping hours. A good daily routine should be cultivated if the voyage is long, all the time possible should be spent on deck amidships, cheerfulness should be maintained, sedatives should be refrained from and, by far the most important, the passenger should learn to be part of the ship.

The most distressing part of a ship's motion is the pitch, as the roll can be anticipated. The sailor learns to go with the ship in pitching, the landsman fights against it. Once the traveler has learned to be part of the ship instead of trying to fight it, a big step toward immunity has been taken.

A MOUNTAIN RACK RAILWAY

One of the knotty problems of mountain railroading is shown in this illustration. It is one of the few short mountain roads of its kind not yet electrically equipped. Instead of drawing

A Steep Climb

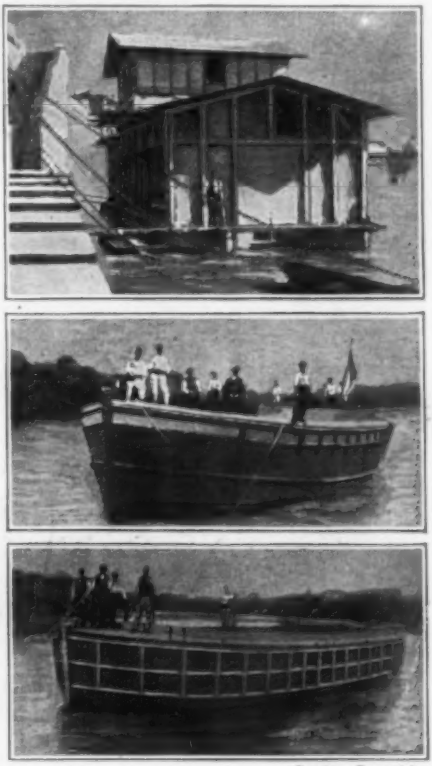
the car up the steep trestle, the engine is attached behind and pushes.

The price of lobsters has been reduced over 50 per cent because of the propagation work done by the United States Fish Commission. More than 100,000,000 were propagated and turned loose at one hatchery last year.

BOATS BUILT OF CEMENT

Unexpected Application of Cement is a Success

Italy, by the foresight of its marine engineers in experimenting with con-



Courtesy Cement Age.

Hulls of Cement

crete as a shipbuilding material, has clearly won the title of "The Land of Concrete Boats." It is not simply a novelty, as some believe, but a clearly defined industry, which is rapidly growing and which will find a still larger field in the United States before many years have passed.

The method of construction is simple, and the boats are quickly made. The cost is less than half that of wooden or steel boats and the cost of maintenance only one-fourth. The boats will stand very rough usage, are practically indestructible so far as the element of time is concerned, and, of

course, are fireproof. It is also claimed that the smooth surface of the cement finish offers less resistance to the water than wood and that the bottoms cannot foul easily or collect seaweed. In case of damage to any portion of the boat repairs can be quickly and cheaply made with cement and concrete.

In the illustrations are shown a floating concrete "Chalet" for the Rome Rowing Club, a 100-ton reinforced concrete government barge, the barge "Ligura," and a pontoon for a floating bridge. The "Chalet," or floating clubhouse, is 67 ft. long by 21 ft. wide, built on reinforced concrete pontoons. The posts and roof are also of concrete. The 100-ton barge was constructed to the order of the Italian government and her tests in the military harbor of Spezzia were so successful that orders were placed for six more. Her length is 51 ft. and her breadth 16 ft. Her hull is composed of double sheeting, forming watertight compartments.

The "Ligura" is a 150-ton barge used in the harbor near Rome. She has made trips down the Tiber to the sea and to Genoa and Savona. The pontoon is one of 60 constructed for a floating bridge on the River Po. The smaller concrete boats now doing service in Italian waters are numerous.

TEACHING WIRELESS TELEGRAPHY IN U. S. NAVY

The wireless telegraph section of the United States Navy electrical school at the New York Navy Yard is one of the most advanced and practical in the world. Under a staff of experts, the young electricians learn the five most important wireless systems, practice receiving and transmitting official messages, draw and study wiring diagrams and learn to install complete wireless sets and adjust to various wave lengths. The course covers 21 weeks and before the men leave the school they become excellent operators and know thoroughly the various types of instruments.

A Class Studying "Wireless"

The school is in direct communication at all times with other stations within a radius of 50 to 100 miles of New York city, and the men get excellent experience in receiving messages from them and from all incoming steamers within the radius. Special sending apparatus is used by which very weak waves are sent out so that there will be no interference with vessels or regular stations.

Seventy square feet of belt surface per minute will transmit 1 hp.

PHOTOGRAPHS OF AN ASIATIC EXECUTION

These photographs, horrible to the extreme, but extraordinary as a difficult and hitherto unattainable photographic accomplishment, were taken in the French Indo-Chinese colony of Annam while a brutal murderer was being executed. No other execution of the kind has even been recorded where a photographer has been allowed to take photographs of every grewsome detail.

The man executed was Ong-Ich-Dong, called Can-Ca, one of the most cruel ruffians in the colony. He had been convicted of wantonly killing women and children. To insure a successful execution the prisoner's hands were tied behind his back and fastened to a stake driven into the ground behind him, holding him kneeling in an upright position. The preparation for death, the grin of the kneeling man, and the execution present a horrible spectacle. The photographs were displayed in different parts of the colony as a warning.

Y. M. C. A. RELAY RACE FROM NEW YORK TO CHICAGO

The 1,000-mile relay race between New York and Chicago, run by fleet sprinters of the many Y. M. C. A.'s along the route, was completed at 9:35 o'clock Tuesday, July 21, 11 hours ahead of the schedule. The boys carried a message in a silver tube from Mayor McClellan, of New York, to Mayor Busse, of Chicago. It was probably the longest relay race ever attempted, and the distance of something over 1,000 miles was covered in 120 hr. 35 min., an average of about 8 6/10 miles an hour for the course.

Trees from America, Europe and Australia are being systematically introduced into New Zealand forests. The native trees are of good size and quantity, but too slow of growth to meet the demand.

JAPANESE HONOR 15,000 RUSSIAN DEAD

Monument Erected Where the Victims of Port Arthur Siege Lie Buried —The Spectacle One of the Most Touching That History Has Ever Recorded

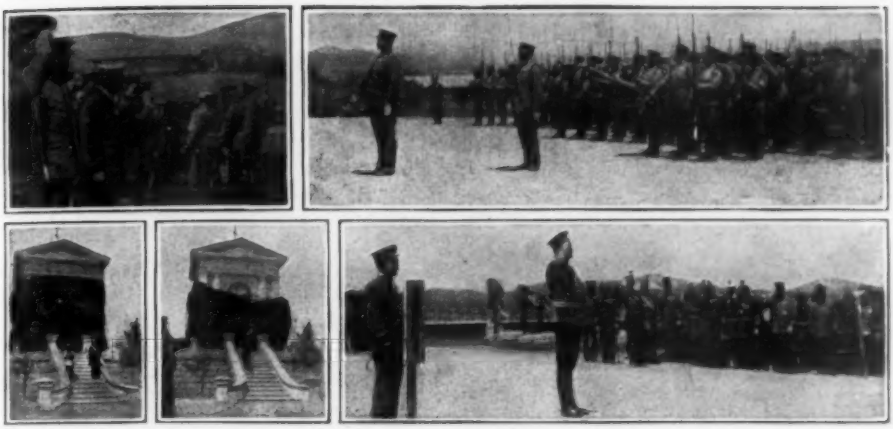
(Translated for Popular Mechanics from L'Illustration)

Upon the initiative of General Oshima, governor of Kewangtung, Japan has erected a collective monument over the remains of the Russian defenders who fell during the siege of Port Arthur. This act is worthy of praise for more than one reason. In the first place, many of the soldiers had received only a temporary burial. They had been buried where they fell. A simple wooden cross, a stone, a hillock oftentimes were the only signs that recalled them to the living.

The environs of the city has become thus a vast necropolis without dignity. Moreover, with the proverbial rapacity of the Chinese, the natives of that nation would steal a button from a tunic, a scabbard from the sabre, and rings and other precious things without being conscious of the crime, then leave the bodies lying where they fell. The Japanese police had decreed severe punishment for such misdeeds. For this reason and for the grandeur of so honoring brave men, the collective monument was decided upon. The idea had been expressed by the Russian government, which asked permission to realize it, but the Japanese, for whom death and above all a dead hero, is the object of great respect, had already commenced the work.

The dedication of the monument took place June 10, the ceremony being conducted by the Japanese author-

Gen. Tchitchakov makes the Sign of the Cross while Gen. Nogi bows his head—At the foot of the steps Admirals Matoussevitch and Hashimoto, also with bared heads, each accompanied by one aide. The other witnesses, officers and troops are 100 ft. to the rear.



Upper Views: Russian Officers Defiling through Lines of Japanese Officers at Salute—39th Regiment Japanese Regulars Saluting the Monument.
Lower Views: Gen. Oshima Unveils the Monument—Gen. Gerngros and Russian Officers Hurrah for the Emperor of Japan "and the Loyal Army."

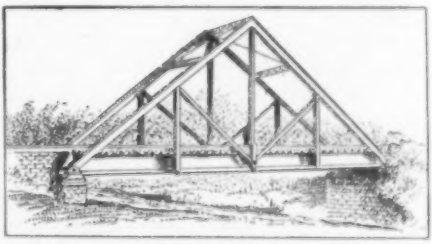
ities and envoys of the Czar. General Nogi was delegated by the Emperor of the Japanese to preside at the solemn occasion. The Czar sent General Gerngros and Admiral Matoussevitch to represent him. With them were also General Tchitchakov, commander of the troops of Harbin, and numerous officers and soldiers, all ex-defenders of Port Arthur. The 39th regiment of the Japanese army and a detachment of marines gave the military salutes in honor of the dead. After the religious consecration by the Russian Bishop Innocent of Pekin, the envoys of the nations climbed the steps of the monument, the Russians making the sign of the cross and the Japanese bending to the ground. After the ceremony General Nogi took the hands of the Russian envoys and shook them vigorously. He could not find words to speak. Then General Gerngros advanced and presented arms. "To the Emperor of Japan—to the brave Japanese army, Hurrah!" he exclaimed. General Nogi then went to his side and cried: "To the Emporer Nicholas—to the brave dead Russians, and to the soldiers who defended so well their country—Banzai!"

Notwithstanding the official character and the religious part of the ceremony, the dedication almost took the aspect of a fete. The rest of the solemn occasion was spent at dinner and at a garden party given at the officers' club by General Oshima. General Nogi with his good humor really drank champagne.

The city government of Milan, Italy, has appropriated $1,500,000 for the construction of a further series of houses especially built for workingmen and their families.

A BRIDGE IN MISSOURI

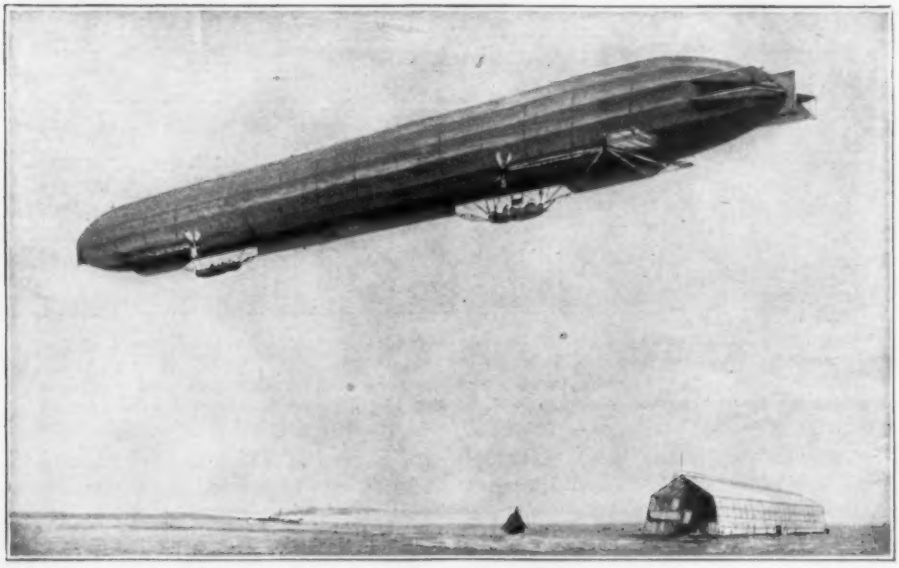
This peculiarly constructed bridge spans a creek near Joplin, Mo. Its



Near Joplin, Mo.

structural work is shaped like an "A" with an angle of 45 degrees. The span is a little over 100 ft. long, making the center about 50 ft. high.

WONDERFUL FLIGHTS OF ZEPPELINS' AIRSHIP



Zeppelin's Airship Starting on 12-Hour Voyage

The huge dirigible airship of the German army, constructed by Count Zeppelin, has proved itself not only the largest but by far the most wonderful dirigible balloon in the world. In one of its recent tests it smashed all the aerial records of the world, staying in the air 12 hours and covering 225 miles in distance, to say nothing of a long series of evolutions.

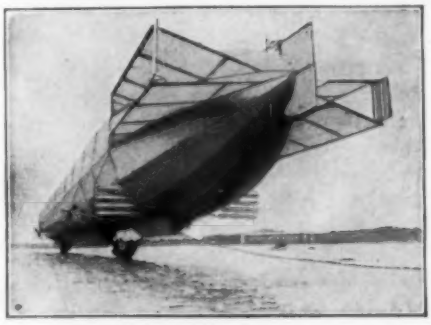
Manned by a crew of 14 persons, it rose from its floating home on Lake Constance and started on its flight. The giant aerial craft passed rapidly over Frauenfeld, Winterhur, hovered over Zurich for 10 minutes, and then disappeared in the direction of Lucerne. At noon it was above Lucerne, and the thousands of astonished tourists from all parts of the world, including hundreds of Americans, greeted it with loud cheering. Before completing its flight it traversed the greater part of northern Switzerland, and on its homeward journey passed over the Albis range of mountains in the high air. Its average speed was 34 miles an hour, reaching an altitude at times of 2,500 ft.

The wireless apparatus successfully underwent severe experiments, working without a hitch during the entire period. Such a flight leads the entire world to wonder what the next great war will divulge in aerial warfare. It seems almost certain that such airships, flying 2,500 to 3,000 ft. above the earth's surface at night, could inflict irreparable damage to warships and succeed in dropping deadly explosives into the very centers of such cities as London, Paris, and Berlin.

Following the wonderful flight above mentioned, came the report from Germany that the great airship was wrecked in a severe storm which burst over the lake while it was being towed into position for a projected 24-hour flight. It was just passing the balloon shed when a violent gust of wind drove shed and airship together with a crash audible a mile away. A great rent was torn in the front part of the gas bag, the fore screw and vertical rudder on one side

were badly damaged, and the stays attached to one of the cars broken. Altogether, the airship, so far as voyaging purposes are concerned, became a wreck, and the flight was postponed indefinitely.

The huge airship is about 460 ft. long, and has a diameter of 45 ft. The gas bag is of the rigid type. That is, the envelope is stretched over 14 circular aluminum frames, placed about 30 ft. apart. These are fastened to a central rod by spokes, arranged in the same manner as in a bicycle wheel. The rod runs from end to end through the center of the gas bag. It has two cars,



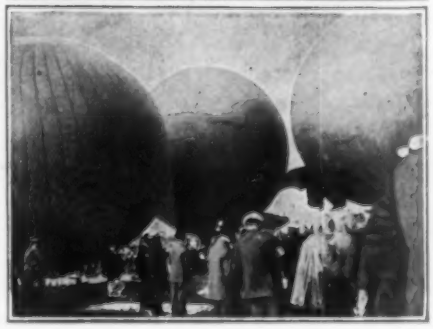
Stern View of Airship

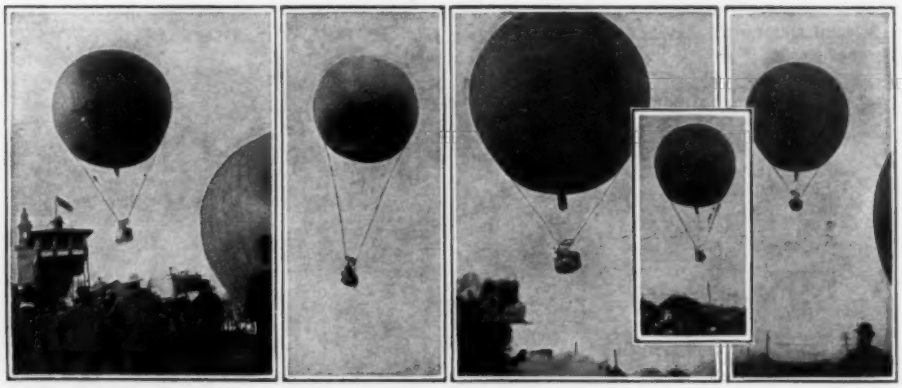
one forward and the other aft. These are suspended in cuts or hollows and offer no obstruction to the air. Both cars are equipped with propellers.

THE CHICAGO BALLOON RACE

The first annual flight of the Chicago Aeronautic club, held on July 4, was spectacular to an almost unparalleled degree and full of thrilling incidents, among which was the fall of the French balloon "Ville de Dieppe" into Lake Michigan and the landing of the balloon "Columbia" in Canada. The occupants of both escaped death by so narrow a margin that if the flight were considered from that viewpoint alone it would be notable.

Nine balloons were entered, all of which got away across Lake Michigan just before dusk. An hour after the last balloon arose into the air, all Chi-





Balloons Starting in Chicago Race — Photo by A. E. Dehnert

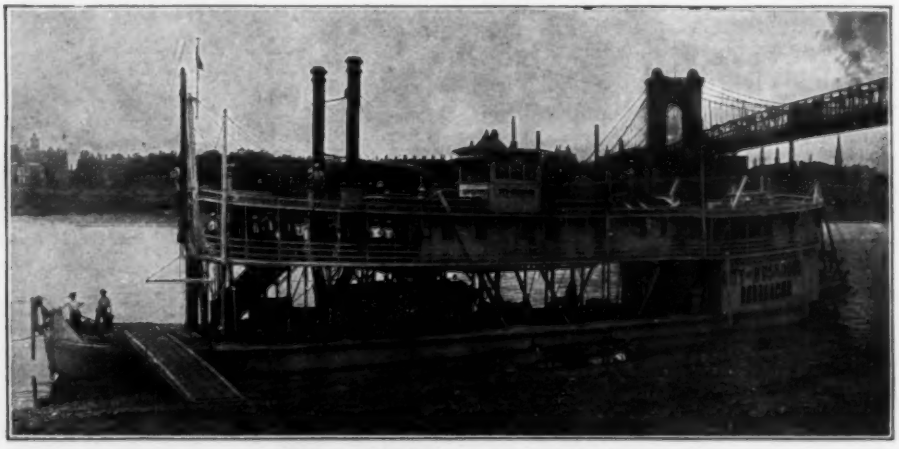
cago was sending up balloons, but they were of the Fourth of July type. The race was won by the Fielding-San Antonio, which landed at West Shefford, Quebec, something over 800 miles from Chicago.

The photographs shown were taken at the Chicago Aero park while the balloons were being inflated. The thousands of spectators who watched them slowly fill and rise like giant puffballs from the ground, enjoyed this part of the exhibition as much as the actual flight. Excellent views are shown in the first two photographs of the iron caps in the tops of the balloon bags. These are the safety valves on which the areronauts depend for a safe drop back to earth again.

THE ARKANSAS NAVIGABLE

To prove to the United States government that the Arkansas river is navigable and that the stream would prove a valuable waterway with a little dredging, the citizens of Muskogee, an Oklahoma city which has grown from 4,000 population four years ago to 25,000 at the present time, raised a sum of $10,000 by public subscription and built the steamer "City of Muskogee" to navigate the stream.

The photograph of the steamer was taken while it was making its trip from the shipyards near Louisville, Ky., to Muskogee. It is the first boat to navigate on the Arkansas river and will be used to carry freight and passengers.



Steamer Built to Prove River Navigable

AN ENGLISH WHIP-TENDER

This genial old lady may be seen at Covent Garden, London, every market morning tending the whips of the carters who come into the market to make their purchases. Although drivers are not averse to leaving a horse and wagon unattended it is a very necessary precaution to leave whips closely watched.

A PREARRANGED COLLISION

The two locomotives shown in this illustration were recently bought from a railroad company by an amusement company and pitted against each other in a head-on collision near Evansville, Ind. The stretch of temporary track on which the locomotives ran was fenced in and admission charged.

After the Crash

PAINTING A HIGH STACK

This tall smokestack, with the scaffolding running one-third of the way to the top, is at Leominster, Mass. The man on a swing near the top is painting.

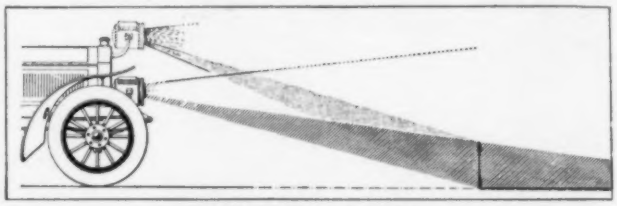
THE WORLD'S TELEPHONES

As accurately as can be estimated, the number of telephones in use today is about 9,500,000, a little over 7,000,000 of which are in the United States, 2,000,000 in Europe and the remainder in all the other parts of the world. Such figures, however, cannot be taken as absolutely reliable. The rapid strides with which the telephone is becoming more and more indispensable to mankind is borne out by the statement that the Bell companies recorded an average of 18,624,000 calls a day during 1907, which would be about 75 calls for every man, woman and child in the United States for the year.

As the storage battery is the natural consort of the gas engine, the growing use of these engines for driving electric generators will undoubtedly be attended by a corresponding increase in storage battery work.

HIGH HEADLIGHTS ON AUTOMOBILES

It is claimed by many autoists that headlights as carried on the majority of cars are too low, and that if carried higher the shadow cast on the roadbed would be much shorter. The longer shadows made by a low headlight make the road surface appear black, while the air above is illuminated. A number of manufacturers are now placing the headlights as shown by the upper lamp in the illustration.



Headlight Placed High

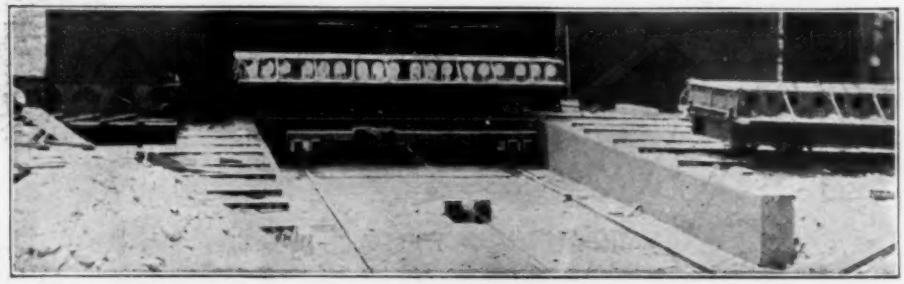
MAKING CONCRETE BLOCKS

This illustration shows part of an arrangement at a concrete works in Los Angeles by which 30 concrete blocks are made at a time. A series of molds, not unlike an egg crate in design, is fastened to the floor of a small car or truck. This car runs on rails fastened to the flooring of another car. Inside the building is a heavy concrete abutment out of which 18 tubes, or cones, project about 4 ft. The car is pushed up against the abutment, thus driving the tubes through the molds, and concrete mixed by machinery is tamped in. The cars are then drawn away from the abutment and the top car runs onto a siding to make room for another one to take its place and have the process repeated.

WINE FROM ANCIENT VAT CONDEMNED

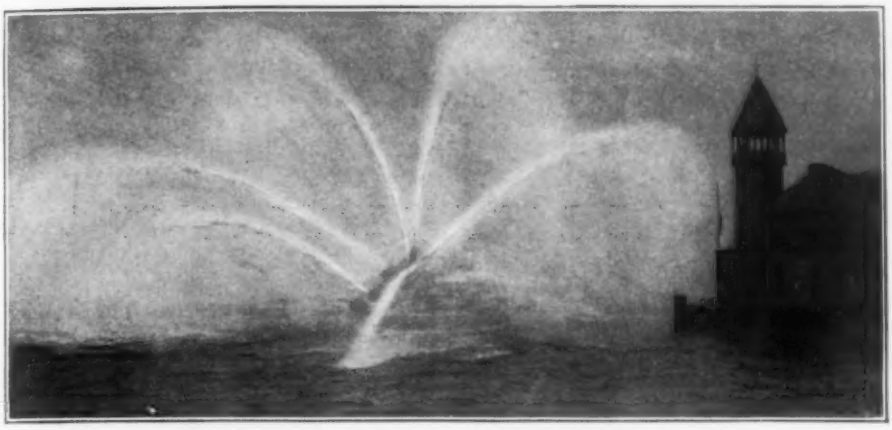
This story dates back to the year 1785, when a wine vat was built at Amarosa in which to store the juices pressed from the fruit of the vine growing on the sunny hills of Spain, and closes its last chapter in San Francisco, hounded to an untimely death by a pure food expert of the Department of Agriculture.

An enterprising San Franciscan who went into the wine importing business immediately after the earthquake heard of this vat and conceived the idea that he could make a barrel of money by securing the ancient stuff and importing it to gratify educated San Francisco's palate. It was invoiced at $3 a bottle. The pure food expert, however, said the stuff contained too high a percentage of plaster of paris, and ordered it sent back, as only 10 per cent of that substance to make wine hold its color is allowed. It also became known that instead of the wine having an age almost equal to the Declaration of Independence, its years had been lessened and its quality attenuated by annual drawings off and additions to the contents of the vat.



Makes 30 Concrete Blocks at a Time

FIREBOATS IN ACTION

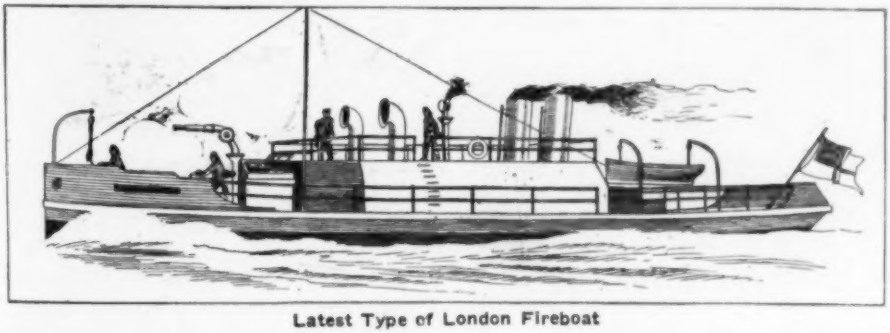


Test of New York Boat Concealed by Its Own Streams

From the time the genuine American is old enough to toddle out of the yard until the time when he is too old to take interest in life the sudden clang of the fire bell finds a ready response. The headlong rush of panting horses, dragging engines, hose-carts and trucks through the streets compels the same sudden heart beats of intense excitement and the uncontrollable desire to rush out into the street and join the mad race to the scene of the devastation. Every American boy knows just what occurs at a fire station the moment an alarm comes in and just what the firemen are expected to do, but the routine of a fireboat and what it may be called upon to attempt is a closed book to most people.

In an article written by Edward F. Croker, chief of the New York fire department, he tells what does, or should, occur the moment an alarm is received, and discusses the different conditions under which a fireboat may have to fight:

"On receipt of an alarm at night the first thing to start is the dynamo, for under the law the boat cannot move until her lights are properly displayed. Then air and circulating pumps are set in motion, and the main engines started. The turbines which drive the fire pumps should be warmed up and the fire pumps turned over dry. If the fire is within striking distance of the standpipes all valves on the pipes to be used should be opened when the boat approaches to 1,000 ft. of the fire, and the water started as soon as in striking distance. If a pier fire the boat should be moved along at moderate speed and all pipes directed into the heart of the fire.



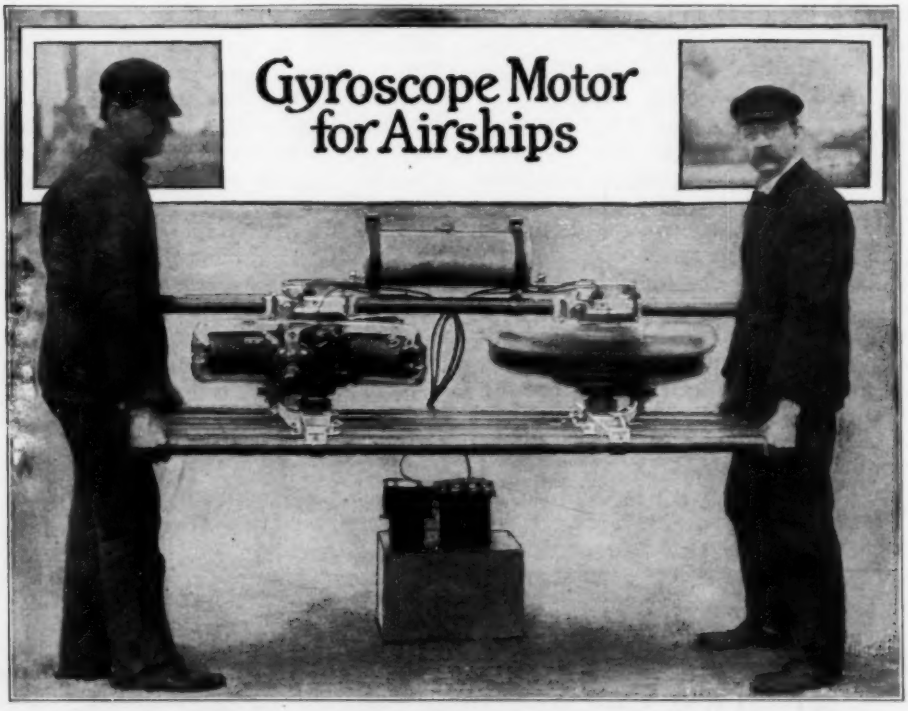
Latest Type of London Fireboat

"Shore lines can be operated successfully at a distance of 500 ft. If through accident or catastrophe the water service of a city should become impaired a fireboat company could stretch lines of 3½-in. hose for a distance of 2,000 ft. Each line could supply two fire engines of the larger size, which in turn could pump the water 1,200 ft. more. In this way one boat could supply about 12 engines with water. It may be thought that 2,000 ft. would be a great distance to force the water through 3½-in. hose, but it must not be forgotten that the fire engines would help, as they would create a vacuum on the receiving side of the pump. Thus the water would have very little atmospheric resistance."

PROGRESS ON PANAMA CANAL

The total excavation on the Panama canal during the month of May was 2,703,923 cu. yd. This established a new record for excavation during the rainy season, for while it shows a decrease of 592,173 cu. yd. as compared with the total for April, it is an increase of 1,687,027 cu. yd. over May, 1907. The rainfall for May was 14.7 in., more than double the amount of rainfall during May, 1907.

When the "Battle Fleet" has finished its cruise around the world it will have covered a distance of about 45,000 miles, nearly twice the distance around the globe.



One of the lightest types of motors of the same power ever constructed is the gyroscopic revolving airship motor here shown. It weighs only 97¼ lb. and is rated at 36 hp. The gyroscopic force is utilized to steady the airship in flight, and the cylinders revolve as one piece in perfect mechanical balance around one center. The pistons swing around another center. It is a continuous circular motion and there is no shock, vibration or loss of power in overcoming the inertia of reciprocating parts. It has no fly-wheel, muffler, or

cooling device, and the valves are closed by centrifugal force instead of by springs.

In the illustration are shown two of these motors held in the hands of two men while one of the motors is running at full speed. The absence of vibration is shown by the clearness of the photograph of the parts not in motion.

GLASS HEADSTONES WITH PHOTOGRAPH OF DECEASED

One of the large Pittsburg plate glass companies is manufacturing grave headstones of glass. The most unique feature of the new tombstone is the fact that in many of the orders executed the photographs of the deceased are blown in the glass.

Photograph on Stone

Photographs of the deceased are also being placed on stone monuments. They are made by an underglazed photo-ceramic process on copper which is dipped in vitrified enamel and subjected to a heat of about 1,400 degrees F. They are then glazed and are guaranteed to be absolutely imperishable, unaffected by exposure to any kind of weather conditions. The large-sized photographs are screwed onto the monuments, and the smaller ones cemented into a groove in the stone.

After October 1 the letter postage between the United States and England will be only 2 cents an ounce instead of 5 cents.

PHOTOGRAPH OF DYNAMITE CHARGE

This photograph was taken just as a charge of dynamite was exploded under

Blasting Stumps in Alaska

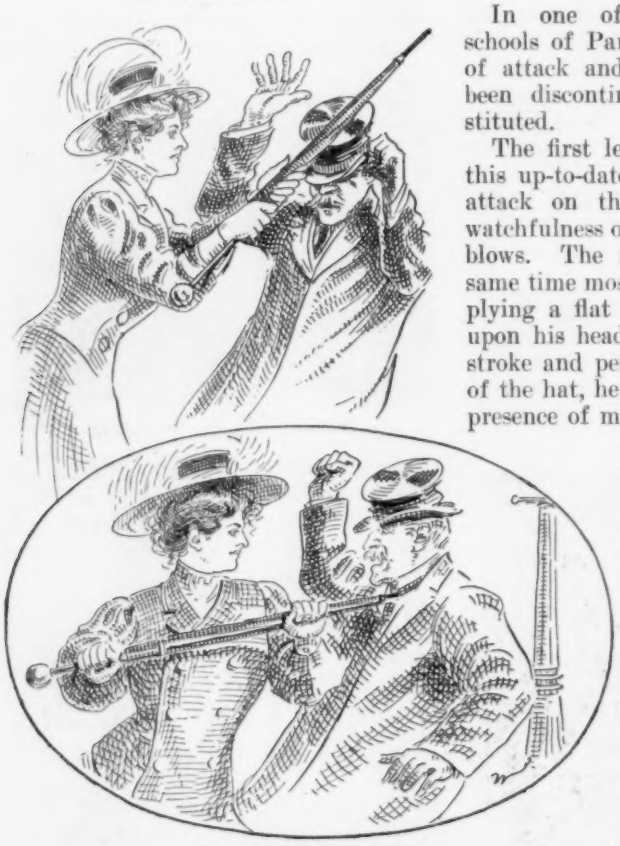
a stump while clearing a field in Alaska. Pieces of the stump and frozen earth were torn from the ground and thrown high in the air. The amateur photographer who took the picture partially shielded himself behind a nearby tree.—Photograph contributed by Owen E. Meals, Valdez, Alaska.

VIEW OF A FREIGHT TRAIN WRECK

In a freight train wreck on the E. & T. H. Ry., near Evansville, Ind., four cars left the track, and plunging down a bank, turned completely over. One of the cars contained eggs, and another was loaded with bottles. The result

Wreck of Eggs and Bottles

was chaos. The illustration shows the positions of the cars.



Two Positions of Attack

GOVERNMENT JURISDICTION OVER SMALL BOATS

A ruling by Supervising Inspector J. H. Westcott, in charge of the Great Lakes district, takes away from local inspectors government jurisdiction over gasoline boats under 15 tons burden, and places the responsibility on the collectors of ports. All complaints received by inspectors against boats under this tonnage will be referred to the collectors and they must determine what equipment is necessary, the quality or condition of gasoline to be used, and the seaworthiness of the craft. The new measure goes into effect immediately.

THE UMBRELLA AS A WEAPON OF DEFENSE

In one of the women's fencing schools of Paris instruction in the art of attack and defense with foils has been discontinued and umbrellas instituted.

The first lesson the pupils learn in this up-to-date means of defense from attack on the streets is to baffle the watchfulness of the aggressor by skillful blows. The most simple and at the same time most effective, consists in applying a flat stroke of the umbrella upon his headgear. Surprised by this stroke and perhaps blinded by the rim of the hat, he has not the time nor the presence of mind to seize the umbrella.

The lunges which follow such a blow are not only effective, but dangerous. The first is known as the "Hors de Combat" blow. Seizing her umbrella near the handle with one hand and near the point with the other and advancing a step with the body well forward, the point if well directed against the center of the aggressor's neck will drop him to the ground senseless and probably badly hurt. The same blow aimed at the pit of the stomach will probably send the recipient to the hospital and perhaps cripple him for life.

Colonel William C. Gorgas, chief sanitary officer of the Isthmian canal zone, has been chosen president of the American Medical Association as a tribute to his scientific research work and sanitary campaign in the warfare on yellow fever in Havana and his successful work of sanitation in Panama.

A Dresden publishing house is about to issue post cards painted by royal artists. The German emperor is expected to contribute to the series.

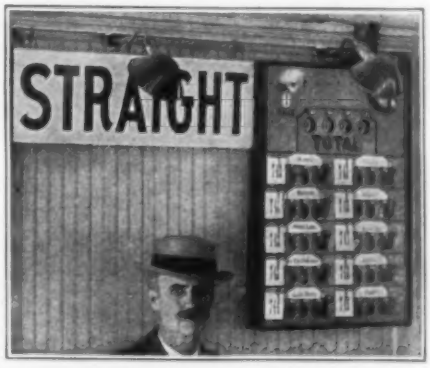
During night operations, carried on without lights, off the south coast of the Isle of Wight, the British torpedo destroyer "Tiger" was cut in two by the armored cruiser "Berwick." The forepart, on which the commander and most of the deck hands were stationed, tilted almost perpendicularly and went down with all hands. The men in the stern part were able to throw themselves clear of the rest of the vessel, and some kept afloat until saved.

MECHANICAL "BOOKMAKERS"

Here is an illustration of the mechanical betting machine which is being installed at a number of race tracks to take the place of the "bookies" and to try and save the racing sport from annihilation due to the almost universal crusade against race-track gambling in this country.

The sign "Straight" means that only horses to win can be played on that particular machine. The man standing alongside takes your money, gives you a card with the number of the horse on it, pulls a little lever, and your bet is tallied on the machine. If your horse wins and you have an exclusive bet, you get all the money in the machine bet on other horses, minus the 5 per cent which the racing commission deducts as its share. If others have bet on the same horse the money is divided according to the amounts of the winning bets.

The numbers appearing on the white squares are the horses. The amounts of the bets appear in the circular places alongside the horse chosen. "Total" means the entire number of bets placed on the race.



New Betting Machine

For the benefit of strangers in London, the council has had a number of outdoor charts constructed with the places of interest marked.

This Great Central Railway locomotive is one of the fastest in England. The external appearance of the English locomotive differs greatly from the American locomotive, and looks much more compact. A large number of them also have a name as well as a number.

A CHEAP DURABLE PAVEMENT

The little city of Mankato, Minn., has solved the problem of constructing a cheap, durable pavement, and one that can be used on steep grades as readily as on a flat surface. It has now stood more than two years of traffic and does not show wear.

In making the pavement the roadway was excavated to a depth of 6 in. and surfaced. Then 5 in. of dry crushed limestone was put on and rolled down with a 10-ton steam roller. Boiling tar from the local gas works was next applied until the entire surface was covered. A layer of broken stone, 1 in. to 1¼ in. in diameter, mixed with coarse gravel, followed this in the proportion of 3 parts stone to 1 part gravel. This was mixed dry on a platform and then thoroughly saturated with hot tar. The resultant mixture was laid 2 in. thick and tamped into place. Dry domestic cement was then applied over this and the street was again rolled. A layer of sand followed, the roller was used for the last time, and the pavement was allowed to stand two weeks before thrown open to traffic. The cost was 80 cents a lineal foot. The pavement is 30 ft. wide and practically waterproof.

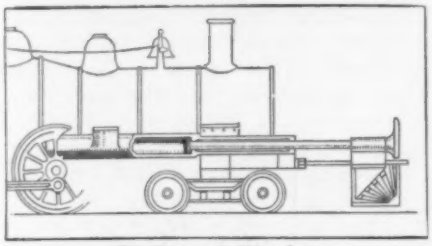
AFTER A TRIP THROUGH MUD

An excellent witness to the bad condition of some country roads is shown in this illustration. The owner of the outfit is Edward Lawrence, a rural mail carrier at Durhamville, N. Y. One afternoon on returning from his route he weighed the mud-covered vehicle and found that it tipped the scales at 950 lb.

What Rural Letter Carriers Often Experience—A Forceful Argument for Good Roads

COMPRESSED AIR BUFFER FOR LOCOMOTIVES

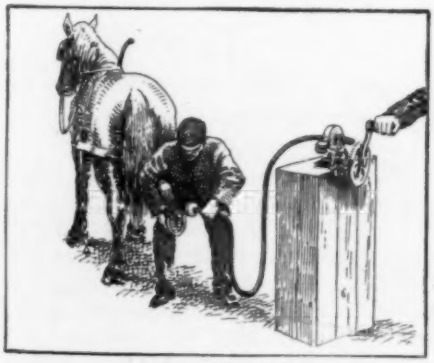
This invention is designed to soften the impact when railroad trains collide with each other or hit some foreign obstacle on the tracks. It is composed of a pair of compressed air tubes or cushions, fitted to the locomotive as shown in the illustration. The air is compressed and securely locked in the cannon-like tubes, and the impact of collision drives the buffers backward until the counter-force of the air stops them. The inventor claims that a collision, ordinarily severe enough to wreck a train, would hardly be felt back of the engine, if it were so equipped.



To Prevent Wrecks

A FLEXIBLE SHAFT GRINDER

Attached to this hand-propelled grinder is a smaller wheel connected by a flexible shaft for use when the article to be ground is stationary or too heavy to be easily handled. It is also used for sharpening the calks of horseshoes.



Mechanical Manicuring

SETTING CONCRETE PILES FOR WHARFS

By Paul Gylistrom

The construction of the municipal wharf for Berkeley, Cal., demonstrates that a much smaller concrete pile can be used and relied upon than has ever been accepted before. At the shore end of the approach the piles are 22 in. in diameter, while those beyond are 2 in. larger. The wharf consists of 450 concrete piles, the average amount of concrete for each pile being 2 cu. yd. and 840 bbl. of cement was used in making the concrete.

The piles are set by using a wooden cylinder which is first driven into the ground and the earth and mud within removed by water pressure from a hose. The hose is forced into the soft material inside the cylinder and the pressure stirs up the mud which flows over the top. The water is then siphoned out.

Novel Dock Construction

The driving of the cylinder is not so difficult as would first appear. It is easily driven to hard pan, which is considered a sufficient depth. Some water is sure to remain in the bottom of the cylinder, and a small portion of dry cement is first shoveled into the bottom, followed with well-tamped concrete. As the wooden cylinders are

comparatively cheap, they are not removed. It is only a matter of time when the teredoes will remove them and then the concrete will first be exposed. The pier is 3,000 ft. long and cost $75,000.

RETURNING TO NATURE FOR HEALTH

In many of the sanitariums and rest resorts in England the patients sleep in the open air, bathe in the sunshine, and when the dew has fallen, walk about in the grass with bare feet. This treatment, with the addition of exercise with many ingenious contrivances for the strengthening of limbs and lungs, is claimed to be highly beneficial.

In these illustrations are shown a muscle-making machine, an elaborate machine for expanding the chest, an arrangement of hand and foot baths, and two patients taking a rest after walking over the dewy grass.

Forms of Treatment Given at English Sanitariums

LONDON MOTOR BUSES UNPROFITABLE

For the past two or three years the London transportation railways, especially the underground companies, have suffered severely from motor-bus competition. From present indications, however, it seems that the competition will not be serious much longer on account of the high rate of depreciation, the existence of which will be appreciated by the owners of automobiles. Although the motor-bus companies provided for considerable depreciation, the result indicates that the allowance was not sufficient and it is claimed that most of them are now losing money.

BRIDGE ACROSS COLUMBIA RIVER

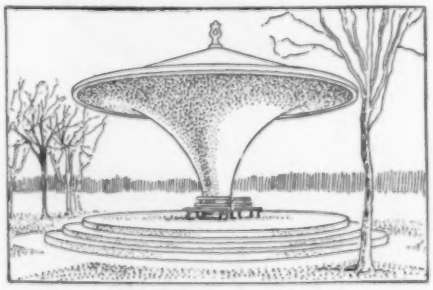
A huge bridge has just been completed across the Columbia river at Vancouver, Wash., by the Great Northern Railroad system at a cost of $1,000,000. Including approaches, the bridge is over a mile and a half long, supported by 48 massive concrete piers, 10 of which are in the main stream and 38 on Stows island and over the deep sloughs on each side.

The bridge is 30 ft. wide and double tracked. The main river pier foundations were sunk 40 ft. below the bed of the stream, and from the foundation up to within 40 ft. of the bridge flooring the piers are of concrete. The remaining 40 ft. of each pier is composed of granite blocks. Near the center of the main stream is a drawbridge 464 ft. long.

ARTISTIC REINFORCED CONCRETE BAND STAND

A reinforced concrete band stand has recently been constructed at Nashville, Tenn., which presented some difficult features in construction, owing to its double curved surfaces and unique design.

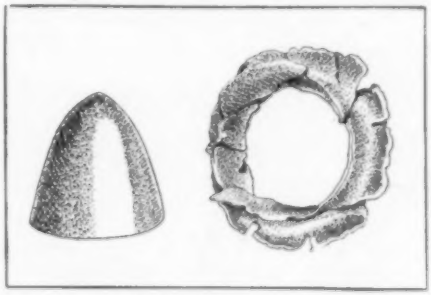
The bars used to reinforce the stem were tied at the bottom to a circular iron band and were held in place at the narrow part of the stem by a similar band and at the outer edge of the ceiling by a hooked connection with the reinforcing rods of the roof. Some difficulty was anticipated in building the surface forms at the small part of the stem on account of the double curve, and as it would have been almost impossible to construct them of wood, sheet steel was resorted to. The sheets were hammered into shape to fit the curve and bolted direct to the circular ribs.



Concrete Band Stand

HADFIELD CAP BEFORE AND AFTER FIRING

These illustrations show a Hadfield steel cap before firing and after it had come in contact with a steel plate. The cap was attached to an ordinary



Before and After Firing

4¼-in. shot, weighing 32 lb., and fired—not against a hard-faced plate, but a plate of high tenacity material. Its condition after firing is doubly interesting because it is probably the only cap ever recovered quite complete, the six segments weighing exactly the same as the cap before it was fired.

THE SNAKE-LIKE PIPE-LINES OF THE WEST

In prehistoric times the lonely places of the earth were supposed to have been inhabited by monster reptiles that stretched their sinuous lengths over hills and valleys. Nothing in the present period of the world more resembles what these monsters were supposed to be than the pipe-lines used for transporting water power in some of the western states.

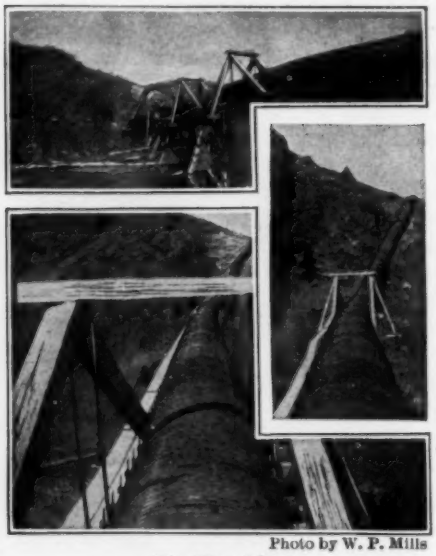


Photo by W. P. Mills

Big Pipe Lines

The line shown in these illustrations is 4 miles long and 4 ft. in diameter. It carries the water which furnishes power to a smelter at Grand Encampment, Wyoming.

STEEL BARGES ON THE MISSISSIPPI

Steps are being taken by business men in St. Louis toward the formation of a $2,000,000 company to own and operate a line of 30 steel barges for the transportation of grain from St. Louis to New Orleans. The Standard Oil Company is also expected to place a number of such barges on the Mississippi river, as it is locating a refinery on the river a few miles north of St. Louis. No official announcement of such an intention has yet been made, but the report is persistent that such barges will be used for transporting oil to New Orleans and other points. Mississippi valley business men declare a revival of river traffic is almost certain.

TRAINING OFFICERS FOR MERCANTILE MARINE

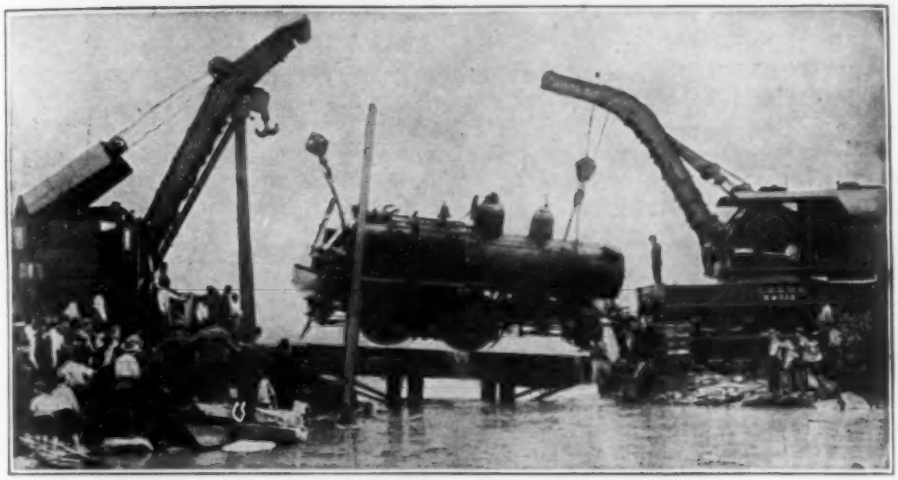
For some time past increasing difficulty has been experienced in obtaining an adequate supply of young officers for the Mercantile Marine, particularly in the case of large passenger steamers, which require men of the highest possible qualifications.

As is everywhere conceded, the best men are those trained on sailing vessels, owing to the varied experience and sense of responsibility thus gained, and for this reason the "White Star" line has fitted out a fast Clyde-built clipper ship, 271 ft. long by 39 ft. in breadth, and placed upon it about 60 cadets. The ship will trade between various parts of the world as opportunity may offer, with the special object of giving a first-class nautical education to suitable young men.

Training Ship "Mersey"

The new armored cruiser "South Dakota" made an average speed of 25½ miles on its final trial trip.

RESCUING A 90-TON ENGINE



A 90-ton locomotive recently ran off an open drawbridge into the river at Sandusky, Ohio. Two powerful wrecking cranes lifted it out of the water and placed it on the tracks as here shown.

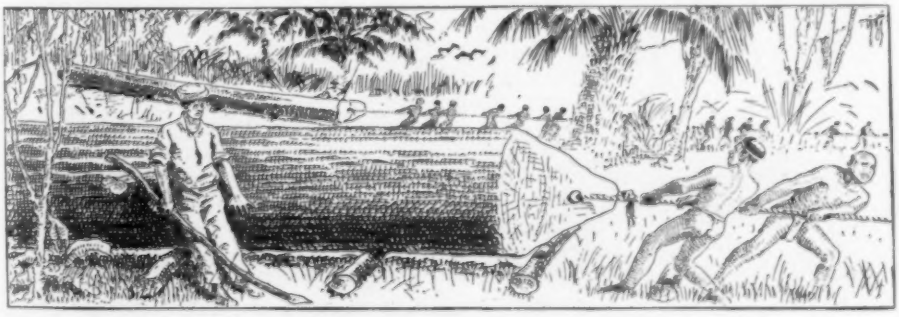
HAULING MAHOGANY LOGS IN AFRICA

The practice of dragging logs by man power, as still carried on in Africa, is called "snigging," and to facilitate this the log is "snapped," which means hewing it to a point. Gangs of from 16 to 20 natives pull at a log, and two or three others place and pick up the rollers. The distances which logs are hauled in this way are not great, the longest hauls being a little over a mile.

DEEP SEA GARDENS PHOTOGRAPHED

An eastern photographer, T. O. Boisen, who has been experimenting for the past few months at Avalon, Santa Cataline island, off the coast of Southern California, with an apparatus for producing submarine photographs, has succeeded in obtaining wonderful impressions of the beautiful sea growth or gardens in that locality.

For the past 20 years photographers

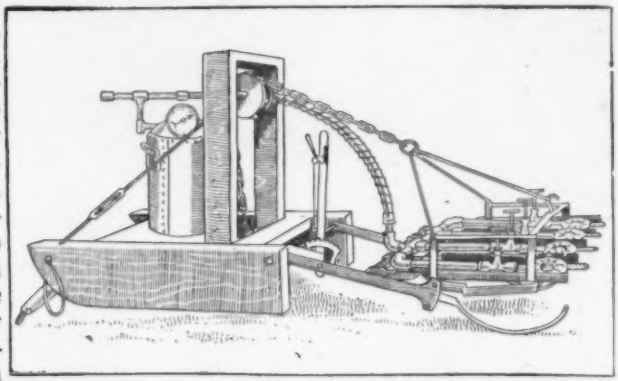


Logs Weighing Tons Are Moved on Rollers

have endeavored to obtain such photographs, but invariably have failed. The method by which this photographer claimed to get satisfactory results is being kept secret.

WEED BURNER FOR SUGAR CANE PLANTATION

One of the latest agricultural devices is a weed burner invented by a Hawaiian planter to be used in the cultivation of cane, or any other crop planted in rows. The machine consists of a tank of gasoline mounted on wheels like a corn cultivator and communicating by flexible pipe or hose to one or more burners swung underneath. On each side of the burner or battery of burners is placed a sheet iron shield to protect the cane from the blaze. On very rough ground the machine can be taken from its wheels and mounted on a sled.



A LIGHTING COMPANY'S EMERGENCY AUTOMOBILE

The gas and electric lighting company of Los Angeles, Cal., has installed an emergency automobile to run to all fires and to respond quickly when repairs are necessary in the homes of its patrons. It is equipped with picks, shovels, hammers, rubber gloves, electric searchlights, safety helmets, a small chemical fire extinguisher, a complete kit of tools for making repairs to wires and pipes, a kit of medicines and bandages for first aid to the injured, and a tank of oxygen. This last feature is for use in resuscitating persons overcome with smoke or gas.

The machine has a 30-hp. engine, and can run 40 miles an hour. Its crew is composed of 8 men, drilled thoroughly in the work required of them. The quick arrival at fires of trained gas and electric men will be of great assistance to the fire department, but this is not all their work. If the gas connections in a house or office building commence to leak or an electric wire is put out of commission the crew is on its way a moment after the trouble is reported.

Photo by C. S. Vance.

Emergency Auto

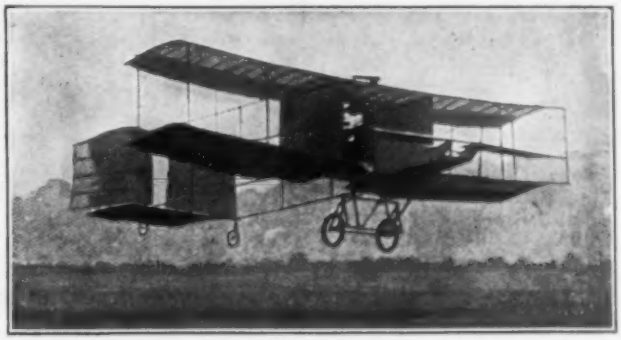
FRENCH FIREWORKS THAT TALK

Fireworks, which not only please the eye but are capable of producing patriotic cries, was the subject of a special communication read before the French Academy of Sciences. The inventors of the system have been working on it for three years, and they now claim that by the arrangement of different explosives they are able to produce both vowels and consonants. They claim to have a railroad cartridge which cries "Stop!" and a 14th of July setpiece which cries "Vive la Republique!"

The great Brooklyn bridge is now 25 years old. Today it is noted not so much for its size as for stability.

DELAGRANGE FLIES 11 MILES

Leon Delagrange, the French aeronaut, broke all aeroplane records on June 22 in Milan. He flew a distance of 11 miles, staying in the air 16 min. 30 sec. The flight was made in a military field, circling around a measured course 9 times. The velocity of the machine was about 38 miles an hour and it flew at a height of 16 ft. A special gold medal was ordered struck off by the Milanese in honor of his performance. The King and Queen of Italy watched his flight from a motor car, the King taking several snapshots of the aeroplane.

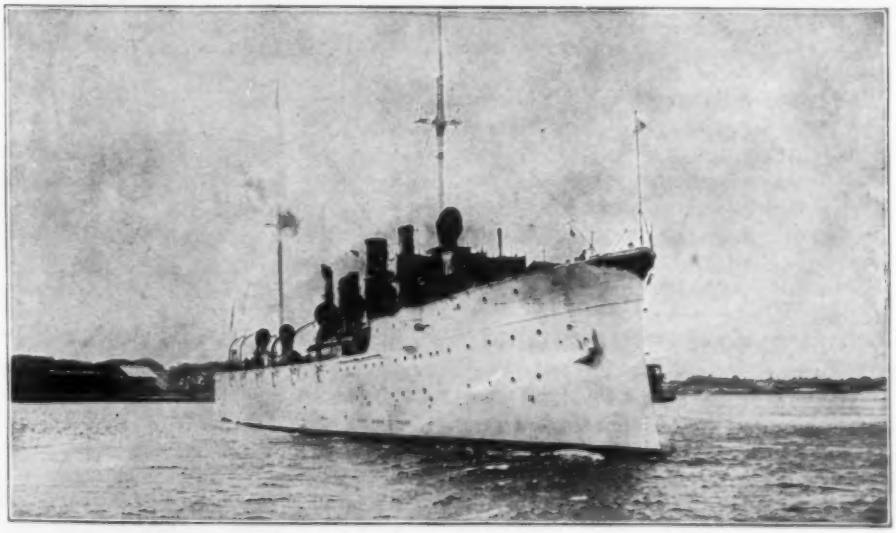


The Delagrange Aeroplane

U. S. SCOUT CRUISER "SALEM"

The United States scout cruiser "Salem," the sister ship of the "Chester" and the "Birmingham," made a speed of 29½ miles in her first trial trip, falling short of the "Chester's" record trip by 1 mile. It was expected, however, that in later trials, she would equal this speed. The work of the three vessels is watched with great interest by marine engineers in the United States and abroad, because of the fact that, although alike in every other detail, all three have a different type of engine. The "Chester" is equipped with English turbines, which have four screws; the "Salem" is equipped with American turbines, with two screws, and the "Birmingham" is equipped with two sets of 4-cylinder triple-expansion reciprocating engines. The engines which prove the most satisfactory will be installed in all new ships of the same class.

The cruisers have a length of 423 ft. 2 in., and a breadth of 46 ft. 8 in.

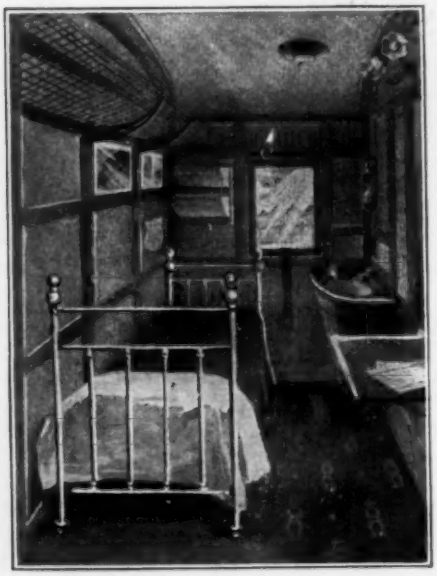


U. S. S.S. "Salem," Fastest Cruiser Afloat

Their batteries consist of two 5-in. guns, six 4-in. guns, and two 21-in. submerged torpedo tubes.

SLEEPING CAR BEDS INSTEAD OF BERTHS

So far as the sleeping arrangements are concerned, the new sleeping cars



A Real Bedroom

of the L. & S. W. railroad in England are a distinct departure from the ordinary type of sleepers. Brass bedsteads take the place of the stuffy berths familiar to all who travel in this country, and heavy upholstery is eliminated. This renders the cars more hygienic and the woodwork can be kept clean. The car consists of seven single and two double sleeping compartments, extending across the car, each of which has its own lavatory.

GIANT CONCRETE BRIDGE

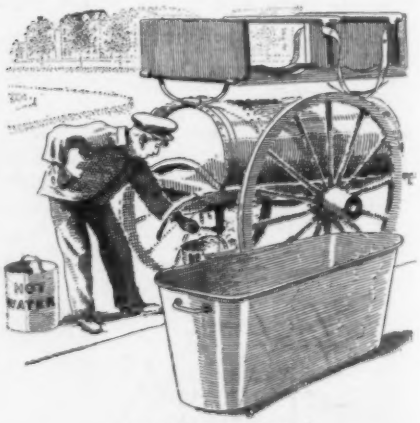
The new bridge across Sputen Duyvil Creek, connecting Manhattan Island with the mainland, which is being constructed as a memorial to Hendrik Hudson, will have by far the largest concrete span in the world, stretching over a distance of 703 ft. At present the widest span in concrete bridges is that of the Grunwald bridge over the Isar at Munich, Germany, the span measuring 230 ft.

The new bridge will represent the highest type of modern reinforced concrete bridge construction, and will have a double deck, the upper deck being 80 ft. wide. The lower deck will not be finished at once, but merely provided for, and will be designed to carry four electric railway tracks. The total length of the structure, including approaches, will be 2,840 ft., and will cost $3,800,000.

THE PARIS BATH PEDDLER

There are in Paris many houses that are bathless, more, perhaps, than in American and English cities. This is, of course, a great inconvenience to the inhabitants, and an ingenious Frenchman, realizing this, goes through the streets with a bath outfit which he lets on hire to anyone who cares to pay the small fee of 35 cents he demands, and, moreover, he supplies the necessary hot water.

The illustrations show the bath and water on their way to a customer, the



Filling an Order

bath-tub being carried into the house, the buckets being filled with water, and the means by which the bath-peddler carries it into the house.

BRITISH AND AMERICAN MINE ACCIDENTS

The state of Pennsylvania produces five-sixths as much coal as all of Great Britain, and in doing so has an accident death rate of 3.97 per 1,000 inside employes against 1.42 per 1,000 inside employes in the English mines. Pennsylvania has more inspectors, both actually and in proportion to the number of mines, than has Great Britain. Each inspector in Pennsylvania has under his charge, on the average, 50 mines; in Great Britain he has 105 mines. There are 4,993,838 tons mined in Pennsylvania per inspector, and 7,076,767 tons in Great Britain.

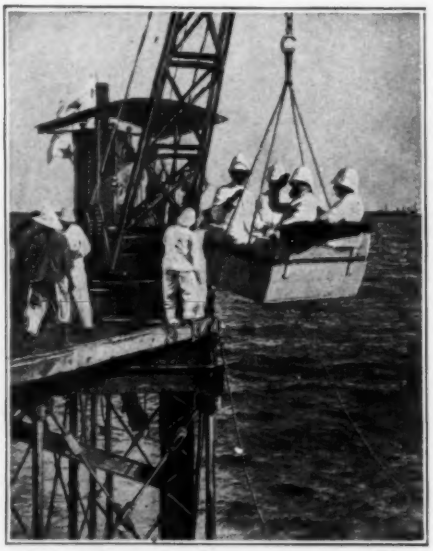
In studying these figures and trying to determine why there are more accidents in the Pennsylvania mines than in all Great Britain the personal carelessness of the miners themselves must be taken into consideration. Over half the mine accidents can be traced to this source. In England nearly all the miners are British born. In the American mines the majority are foreign born, with many of a low order of intelligence. The few who are Americans are at the head of their trade.

Two persons were killed and many injured in the collapse of this brick building in Cincinnati. The photograph was taken a few minutes after the accident, while the patrol wagons were carrying away the injured.

PRESERVING AND ANALYZING THE BRAIN

In preserving the brain for analyzation the scientist first treats it to a bath of chemically prepared wax at a high temperature, prepared after the formula of a famous Italian chemist who discovered this process as a means of preventing deterioration of cells. By this process the wax enters every part of the brain, preserving every tiny seam just as the wax of the phonograph record preserves every intonation of the voice. After being subjected to the preparation, pieces of almost unbelievable thinness can be taken from the brain for minute study under the microscope.

A school of languages for parrots has been established in Paris. The birds are taught to speak English, French, German and Italian.



A LANDING ON THE WEST COAST OF AFRICA

When M. Millies-Lacroix, minister of the French colonies, made his visit to the French possessions in Western Africa, he met with a number of exciting but pleasant experiences, one of the most notable of which was his landing at the wharf of one of the ports. He and his party came ashore from the cruiser in an African canoe and on approaching the wharf a huge basket was let down and a derrick hauled them up.

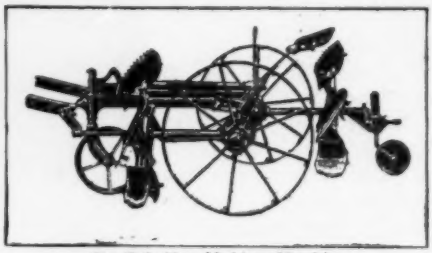
WATERWORKS DESTROYED BY EXPLOSION

This illustration gives a clear conception of what remained of the Gallipolis, Ohio, waterworks after the explosion of a boiler. The furnaces were blown completely clear of the wreckage, thus making the added devastation of fire impossible.

A Bad Wreck

ENGLISH SWATH-TURNING MACHINE

The hay-making machine shown in this illustration is a swath turner used in the hay fields of the British Isles. It is equipped with two sets of turners, each having five blades. One set is located forward on the left side of the machine and the other on the right side at the rear.



English Hay-Making Machine

JAPANESE WOMAN DIVERS

In the province of Shima, on the south coast of the Japanese empire, women are the sterner sex, and not only do most of the work in the fields, but are also employed as divers. Stripped to the waist, they enter the water at all seasons except during the coldest months of winter. They remain under water sometimes for over a minute, and fish up shell-fish and tengusa, a kind of seaweed. They place their catch in small nets carried at the girdle.

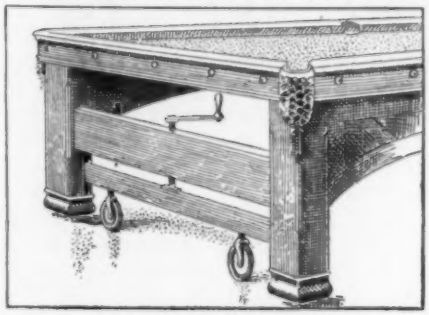
A SKYSCRAPER 62 STORIES HIGH WILL BE NEXT

Plans for a gigantic building, to be the loftiest in the world, overtopping by more than 200 ft. the Metropolitan building, were filed the latter part of June with the building superintendent of New York by the Equitable Life Assurance society.

With its tower, as now planned, the new building will have 62 stories and will reach to a height of 909 ft. above the curb. The flag pole will run up 150 ft. higher. The building will cost $10,000,000, and the plans call for a main building of 34 stories, reaching to a height of 489 ft. Above the main building the tower will rise heavenward 420 ft., having 28 stories. Its construction will be in two sections, one section extending from the 34th to the 49th story, and the other, a narrower one, rising from the 49th to the 58th story. The cupola will extend 4 stories above this.

PORTABLE BILLIARD TABLE

One of the latest billiard tables placed on the English market is called the "mobile" table, and unlike every other standard table ever manufactured it can be moved from one part of a room to another with but little trouble.

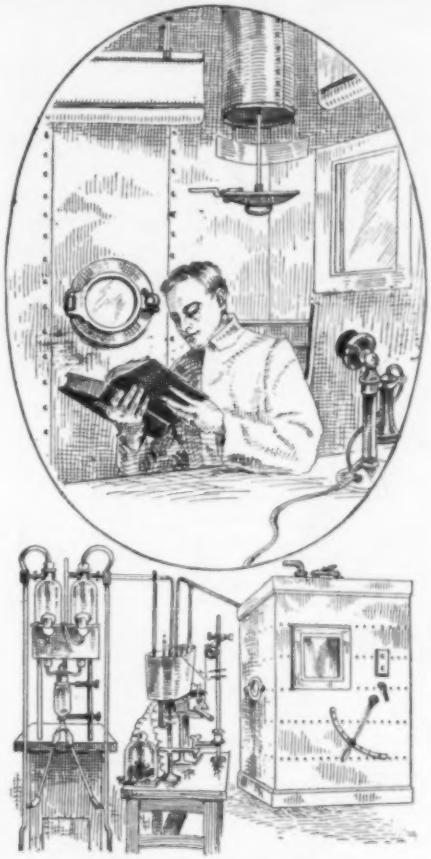


Billiard Table on Wheels

When stationary it stands as solidly on its four massive legs as any other table, but when the space it occupies is wanted for some other purpose, the cranks at each end are turned, raising the legs off the floor and leaving the entire table resting on four small wheels.

MEASURING MENTAL AND MANUAL ENERGY

The calorimeter, or human energy-testing apparatus, at Sheffield University in England, is designed to show the amount of energy as represented



Apparatus to Measure Human Energy

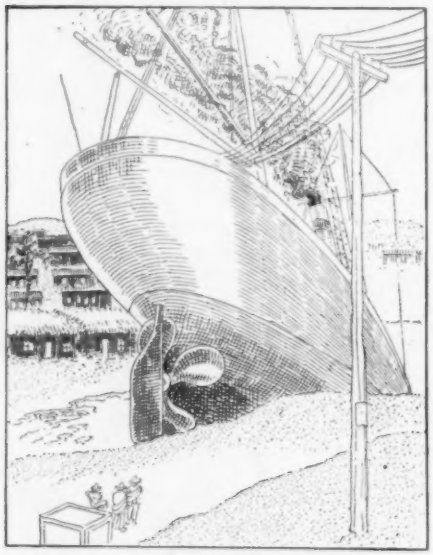
by the heat given off from the body, expended upon mental and manual work, and also to determine what food products are the most economical and best for workers with brain or hands.

In the experiments a man is shut up in the apparatus, which is of copper, and studied night and day by scientists, who watch him through a port-hole. Food is passed to him through a double trap-door, and his only means of communication with the outside world is by means of a telephone. Through the

telephone he is told what to do. Part of the time he occupies himself with brain work and part of the time at manual labor. During the entire time the machine is registering his energy under the different conditions.

WRECKED SHIP LIGHTS TOWN

Last March the "Sesostris," a 4,000-ton freighter, was feeling her way along the coast of Guatemala in a dense fog when suddenly she drove her prow up on the sands at the little town of Ocos and stuck there. Despite the aid of three other vessels which chanced to come along, the ship remained hard and fast and as the days went by be-

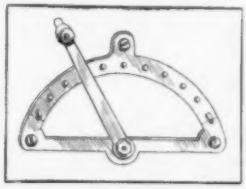


Left High and Dry

came more and more firmly wedged in the soft sand and silt. The sand gradually piled up on both sides so that it was possible to walk almost around her, and the residents of the town, grasping the opportunity so unexpectedly dropped in their very midst, made request to the captain to string wires from the ship's dynamos and light the place up a bit. This was done and for some time the little coffee station boasted of its electric lighting plant. The underwriters, however, decided to remove the machinery and sell the hull to the railroad company as a coffee warehouse.

HOT OR COLD AIR LEVER FOR CARBURETTERS

This lever, fastened to the dashboard of the automobile, varies the supply of hot and cold air to the carburetter and regulates the air admission when starting the engine. For ease of starting, the main air supply can be varied from full open to full closed position by a turn of the lever. By admitting hot air, cold air, or a mixture of the two, it gives the driver the requisite control over the carburetter for all differences of temperature and atmospheric moisture.



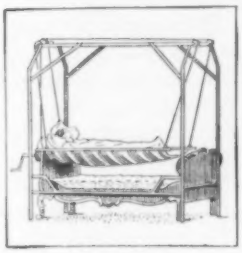
COPPER AND STEEL LIGHTNING RODS

The choice of lightning rod material should be between copper and steel. The smokestacks of the United States government power plants are all rodded with copper, which better resists the acid in smoke. Copper is superior to steel in carrying electricity, but the thunderbolt is an oscillating current, moving to and fro perhaps a million times in a second, like a bent spring when it is released. Steel, having but one-seventh the conductivity of copper, damps out the oscillations better and is not so likely to melt. The fusing of a steel rod is a rare accident, as it will carry to earth a thunderbolt that melts it.

Steel rods are star-shaped and copper ones are made in strands in order that they may have a large surface. For the ordinary farm building the galvanized steel star-shaped rod is ample, but where the expense is justified by the value of the building the same rod, copper-covered, is desirable.

COMBINED COUCH AND HAMMOCK

A French manufacturing concern has placed on the market this combination invalids' couch and hammock. Ill people often tire of lying in bed and the mattress becomes so uncomfortable to them that it is impossible to rest. By this device they can either lie on the couch or be suspended in the air. The body of the hammock is made of canvas, covered with a linen sheet, and the patient is upon it all the time, whether suspended or lying on the couch. Straps are attached to the end of the hammock and made fast to a framework above the couch, and by turning a crank the patient is raised and lowered. When on the couch the body of the hammock simply makes an extra covering for the mattress.



PHOTOGRAPHING THE STOMACH

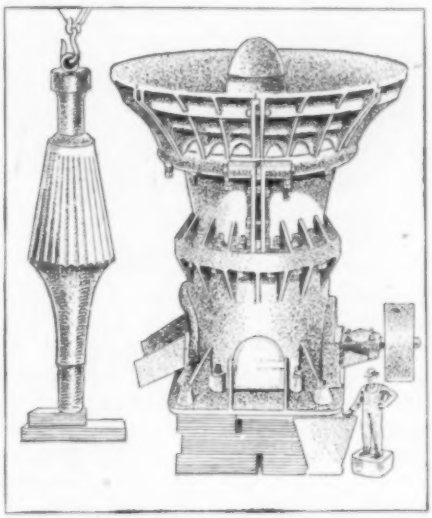
A new apparatus has been devised by a physician in Munich, by which the inside of the stomach can be clearly photographed. The camera is actually swallowed by the patient, and when it reaches its destination the interior of the stomach is illuminated by a small electric lamp attached to the apparatus. At the bottom of the camera is wound a photographic film 20 in. long and ¼ of an inch wide. The physician pulls a cord which runs the film past the lens, the electric lamp is turned on, and the impression is made on the sensitive film. This procedure is repeated until the requisite number of pictures have been taken.

A school of languages for parrots has been established in Paris. The birds are taught to speak English, French, German and Italian.

LARGEST ROCK CRUSHER IN THE WORLD

The largest rock crusher in the world is at South Pittsburg, Tenn., where it prepares all the rock used in a cement plant which turns out 4,000 bbl. of cement per day. It crushes an exceedingly hard and tough limestone to a 6-in. size and smaller at the rate of 800 tons per hour. Nearly 60 per cent of this is under 4 in. in size, and 30 per cent under 2 in.

The crusher is 18 ft. 11 in. high and its hopper has a diameter of 20 ft. Its weight is 425,000 lb. The top shell of the machine is made in two pieces connected by 14-in. bolts. Each half with its concave weighs 73,000 lb. The main shaft weighs 33,000 lb. and is 30 in. in diameter. The crushing head is 7 ft. high and 65 in. in diameter, weighing 32,000 lb. The design of the crusher was based on an assumption of a crushing pressure near the bottom of the head of 1,500,000 lb.

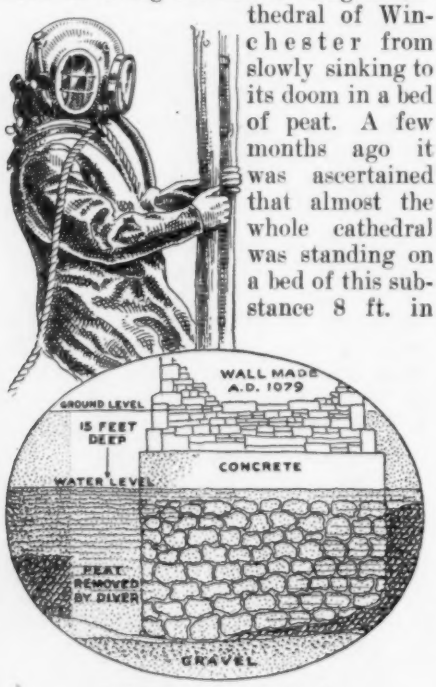


Its Weight Is 425,000 Lb.

The new armored turbine cruiser "Indomitable" of the British navy has broken all world records for warships of her class by steaming at a speed of 32½ miles an hour.

DIVING UNDERNEATH A CATHEDRAL

Extraordinary as it may seem, a submarine diver bore the brunt of the work of saving the famous English cathedral of Winchester from slowly sinking to its doom in a bed of peat. A few months ago it was ascertained that almost the whole cathedral was standing on a bed of this substance 8 ft. in



Where the Diver Worked

thickness. Owing to its compression, settlements of a serious nature were taking place. It was therefore decided to excavate the peat and provide in its place a solid sub-foundation, but in carrying the excavation down to the lowest layer a great volume of water burst up from the gravel strata below, rapidly filling the pit.

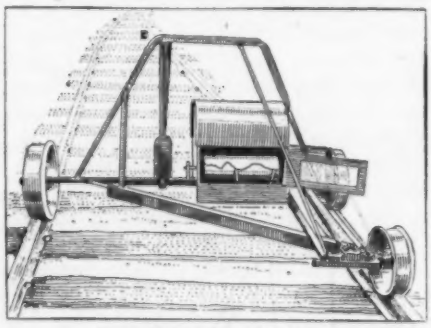
This condition of affairs led to the decision to employ a diver for the work of removing the peat. The diver's operations were not only peculiar but arduous. The pits sunk were absolutely dark, owing to the water being thick with peaty matter, and artificial light was impossible. Upon the removal of the peat the bottom was covered with bags of concrete, carefully and tightly trodden in all around. These were then cut open and another layer of bags placed on top, the operation being continued until the flood of water from the gravel was sealed down.

RURAL TELEPHONES AS FIRE ALARM SYSTEM

The farmers in the vicinity of Ewan, N. J., have converted the rural telephone service into a fire alarm system. Nearly all the farm houses are connected by telephone, and when a fire is discovered a general alarm is sent over the wires for three or four miles in every direction. Recently, when a barn caught fire, the system was given an actual tryout, and a few minutes after the alarm was sounded the farmers began to arrive.

TRACK INSPECTING AND RECORDING MACHINE

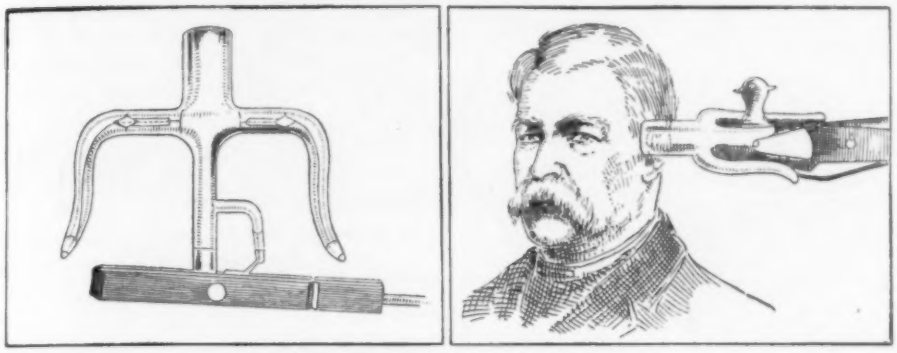
The machine which is shown in this illustration resembles a 3-wheel track velocipede, and in use is coupled behind an inspection or hand-car. It weighs 200 lb. and can be run at any speed up to 12 miles an hour. On a continuous roll of paper it draws a diagram showing the condition of the tracks as to surface, and if the rails are level on tangents and have the proper superelevation on curves. It also records low joints, showing the amount of depression, and all variations from



Records the Rough Places

the proper gauge. On the machine is a wheel 3 ft. in circumference, which is connected to a cyclometer and is used in making measurements.

PROTECTION FOR THE X-RAY OPERATOR



Important Improvement in X-Ray Apparatus

Through the invention of a device known as the "Cornell Tube," by a professor in the Cornell University Medical College, it is believed that the death lurking in the X-ray machine can be eliminated.

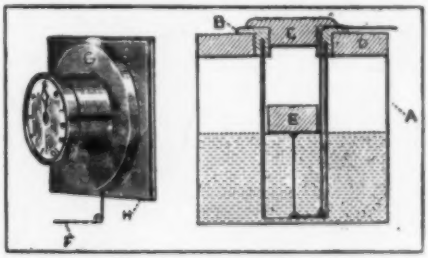
As has been before stated in this magazine, the danger from the X-ray has been more to the operator than to the patient. This is because operators use it constantly, while its contact with patients is limited. So malevolent is its force that already nine wellknown scientists have met death from its use, and therefore every new method of controlling it is hailed with delight by the profession.

Under the old system of employing the ray, the end of the instrument from which the force is discharged was held several inches from the portion of the patient's body to be operated upon. As the rays do not travel straight ahead after leaving the point of discharge, but spread out in every direction like the ripples expanding from a pebble thrown into water, the operator was sure to receive some of its force no matter where standing.

With the new device, which consists of a tube made of heavy lead glass, the air space formerly permitted between the apparatus and the patient is done away with. No rays can escape from it save through a flint glass window at the end, and as this corresponds in size to the lesion to be treated the rays go straight to the point where they are to do their work. They operate on the diseased tissues alone and harm neither operator nor patient. When the tube is brought into direct contact with the patient, only the ionizing effect of the X-ray is exerted on the tissues, and this effect is claimed to be all that is required to accomplish the desired results.

FUEL GAUGE FOR MOTOR BOATS

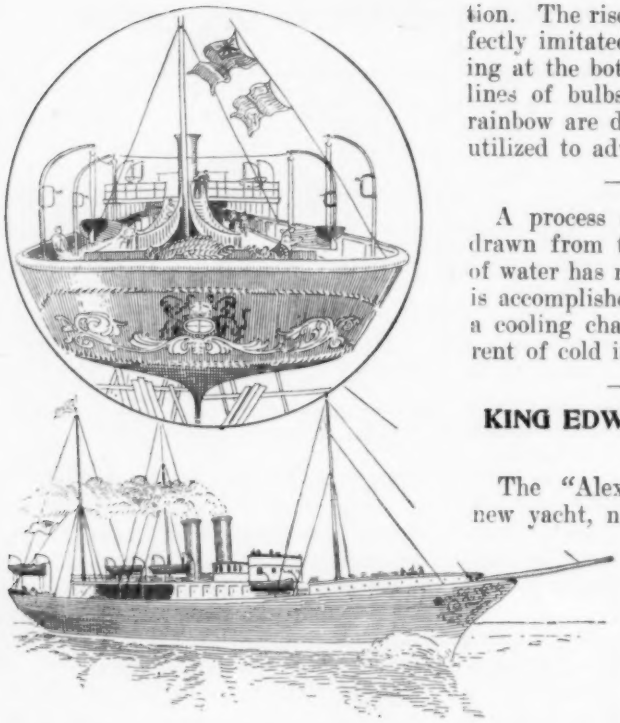
This fuel tank gauge for use on motor boats consists of an indicator, a cable, and a float. Its installation does not require any cutting of the tank, as it is only necessary to insert the float through the filling opening, fasten the



Gasoline Tank Gauge

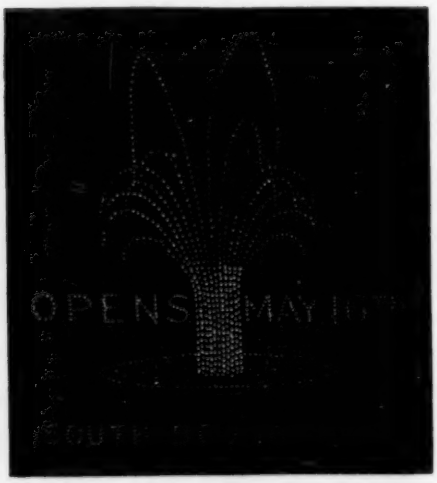
dial in some conspicuous place, and properly connect the cord.

The first postoffice was a private enterprise launched about 1464.



A FOUNTAIN OF ELECTRIC LIGHTS

One of the latest and most effective of electric advertising sign designs is the fountain shown in this illustration. The rise and fall of water is perfectly imitated, the illumination starting at the bottom and running up the lines of bulbs. All the colors in the rainbow are displayed. The display is utilized to advertise summer resorts.



A Fountain of Light

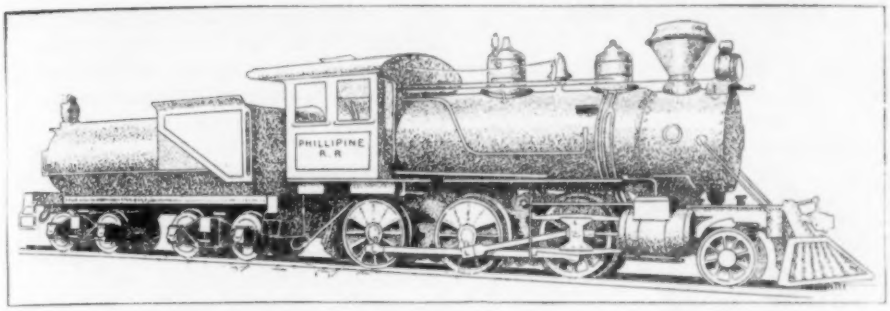
A process of quenching coke when drawn from the oven without the use of water has recently been patented. It is accomplished by placing the coke in a cooling chamber and forcing a current of cold inert gas over it.

KING EDWARD'S NEW YACHT

The "Alexandra," King Edward's new yacht, named after the Queen of England, was built for the exclusive use of the royal family, and has but few accommodations for guests. She is much smaller than the "Victoria and Albert," but resembles the older vessel in many respects. In her trial trip she made a speed of 22½ miles an hour.

MILLIONS OF RAILROAD CAPITAL IDLE

The American Railway association on April 29 reported 413,000 freight cars idle, many of which are the large capacity cars which have been purchased in recent years at prices ranging up to $1,300 a car. The sudden decline in industrial activity was given as the cause of their idleness. The average cost of the idle cars is given as $1,000, and at that figure it means that the railroads of the country had tied up in unproductive capital over $400,000,000. Add to this the cost of the 6,500 locomotives which would be necessary to haul the cars if in use, and the above figure would be enlarged by nearly $120,000,000 more. During the past month orders for the immediate repair of 25,000 cars have been issued, indicating the increase in shipments.

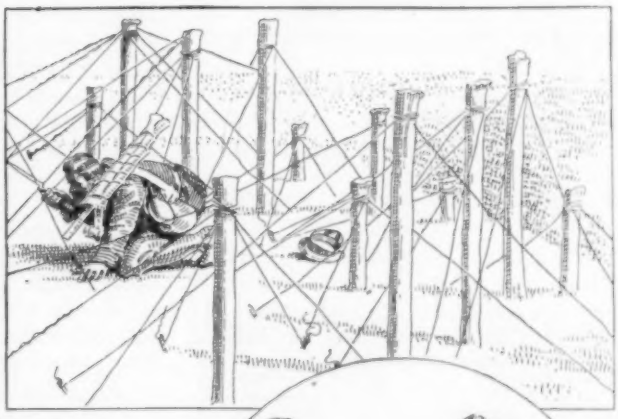


LOCOMOTIVES FOR THE PHILIPPINES

Six locomotives of this type have recently been delivered to the Philippine Railway Co. for use as freight engines. The fuel they will burn is Philippine lignite, a mineral coal retaining the texture of the wood from which it was formed. The tenders have cylindrical water tanks.

RUSSIAN MILITARY TOURNAMENT

At a recent military tournament at Odessa the Russian army showed that it had learned many lessons from the Russo-Japanese war. The soldiers gave displays of the methods of scaling steep walls and of penetrating wire entanglements, which proved so deadly an obstacle at Port Arthur. One of these illustrations shows a soldier in full kit penetrating a wire entanglement, and the other a Cossack officer tilting at a mounted dummy running on a rail.



WIRELESS STATION ON ST. PETER'S DOME

According to a leading clerical paper of Rome, the Pope is to be presented with a Marconi wireless apparatus, to be installed on the dome of St. Peter's. To be of practical use, however, the installation of corresponding stations would be required by Catholic bodies in other countries.

GERMAN MAIL BOX

In Berlin the mail boxes are funnel-shaped and stand nearly 5 ft. high. The mail carriers gather the mail by

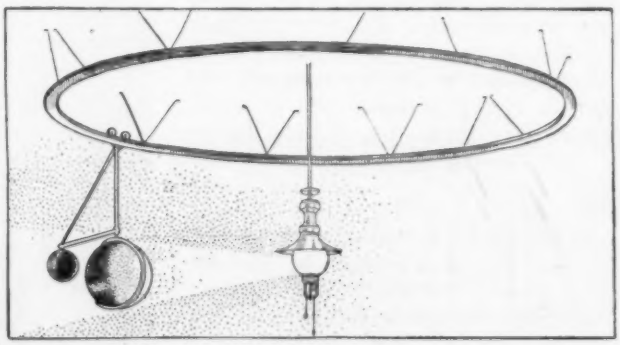
German Mail Box

opening a large door in the side. Papers, packages and letters are dropped in the same box.

A MINIATURE SOLAR SYSTEM

A miniature solar system by which all the phenomena of the earth and moon may be truthfully duplicated, including eclipses, rotation, revolution, seasons, vertical and oblique rays, eccentricity of orbit, etc., has been constructed by Prof. W. M. Mills, of the Northern Michigan Normal School, and erected in his classroom.

The sun is a 100-cp. gas burner. Around this is an orbit about 10 ft. long and nearly as wide, constructed in elliptical form so as to correspond with that of the solar system. This was sawed from pine and around it was bolted a steel rail. On this runs the carriage to which the earth is attached. The earth is suspended from the carriage by a flat steel rod fastened to a swivel and weighted on the under side so as to keep it always swung to the north. The moon hangs from a cord fastened to the top of the rod which holds the earth, and is held out away from it by a piece of wood. By pulling the earth around in its orbit the moon revolves itself from centrifugal force and thus all the workings of the system are duplicated.

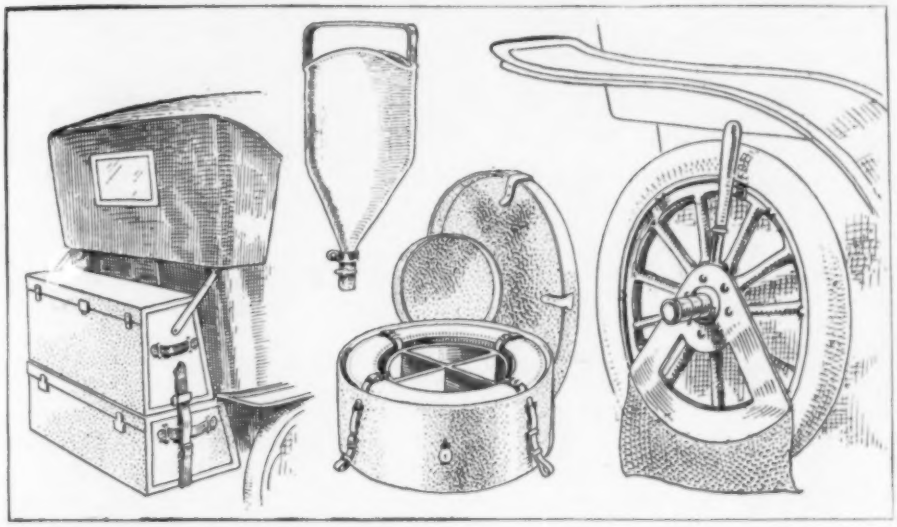


TWO KINDS OF WATER FROM SAME WELL

In investigating the wells and underground waters of Florida, the experts of the United States geological survey found a well at Weleka, on the St. James river, from which two kinds of water are obtained.

The well is 309 ft. deep, and the length of the casing 110 ft. It was first drilled to a depth of 160 ft. and from this depth ordinary "sulphur" water was obtained. The drill was then carried to a depth of 309 ft., where it encountered a strong mineral water, having a disagreeable, salty taste. In order to use both kinds of water an inner tubing was run nearly to the bottom of the well and both were connected with pumps, so that ordinary water and mineral water can be pumped at the same time. A favorite joke played on visitors is to give them a drink of the ordinary water first and then replace it in the second glass with the brine.

NEW ENGLISH AUTOMOBILE ACCESSORIES



Among the most interesting of the new English automobile accessories is a shrapnel splashguard, a water pail, a tire box and a pair of grid trunks.

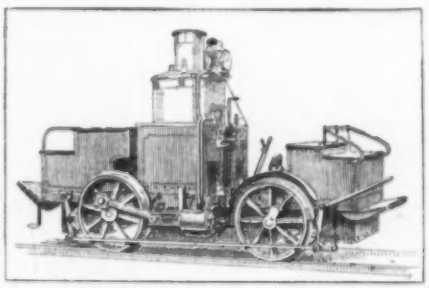
The shrapnel splashguard is an ingenious device designed to stop lateral mud splashing by automobiles in general, and London motor buses and cabs in particular. It consists of a plate or frame, having near its apex a bearing which serves to carry it on the wheel hub. In order to avoid the damage which might be caused if the splashguard strike any obstacles on the road it is left free to make a half revolution in a plane parallel to the wheel, being promptly returned to its normal position by means of a spring. The lower or "business" end of the guard consists of a fabric made by meshing together steel links. This produces a material which is so flexible that it can be adjusted quite close to the road, and owing to the floating method of attachment can strike small or large stones without damage.

The water pail is made of brown canvas, rubber-lined, with a long, stiff handle to carry it by, and to help hold it in shape when filled. The outlet is at the bottom, controlled by a butterfly valve.

The grid trunks are fastened to the back of the automobile with straps, and are so shaped as to fit snugly in place. The material of the trunks is, of course, waterproof and can be readily cleaned of mud and dust. The tire box holds four tires and is usually fastened to the footboard.

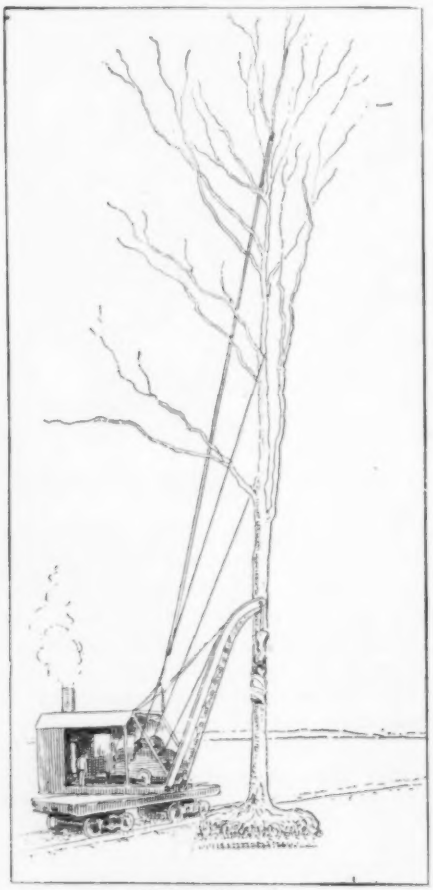
SOUTH AMERICAN RAILWAY FIRE ENGINE

The railway fire engine shown in this illustration is used on the railroad running into Buenos Ayres, Argentina. It is of English make.



TRANSPLANTING A TREE WITH LOCOMOTIVE CRANE

During the extension of a manufacturing plant at Ampere, N. J., it became necessary to build the yard tracks



Moving 80-Ft. Tree

over the place where this and other trees stood, and rather than destroy them the company successfully undertook their transportation to other parts of the grounds by the method here shown.

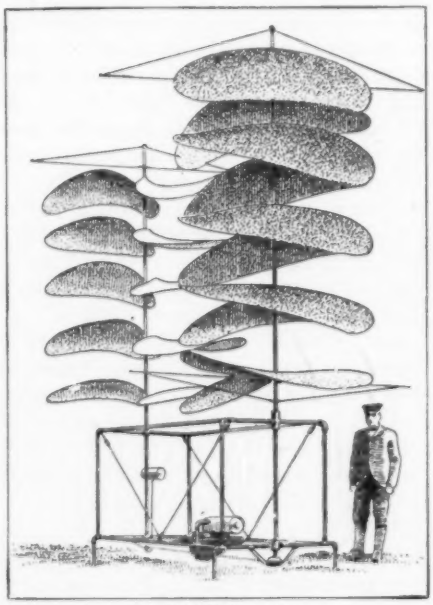
The tree in this illustration is an oak, some 80 ft. in height, and about 18 in. in diameter, with a ball of earth and roots 15 ft. in diameter. In making fast to the tree the bark was protected by burlap, wrapped around the trunk and crane hook. A large block offset was found necessary to keep the tree upright against the uneven distribution of weight. It was moved several hundred feet.

PRECIOUS STONES PRODUCED IN UNITED STATES

The total value of precious stones produced in the United States during 1907 is placed by the geological survey at $471,300, as compared with $208,000 in 1906. This great increase is due chiefly to a large output of sapphire in Montana, of both the blue and the variegated variety. A new gem mineral has been added to the list of known precious stones. It is called "benitoite," has a blue color and a high reflective index, and is found in Alexander county, North Carolina.

FLYING-MACHINE WITH SPIRAL HELICES

This European flying-machine is kept afloat by a series of spiral helices, and the method is a practical realization of that forecast by Jules Verne in "The Clipper of the Clouds."



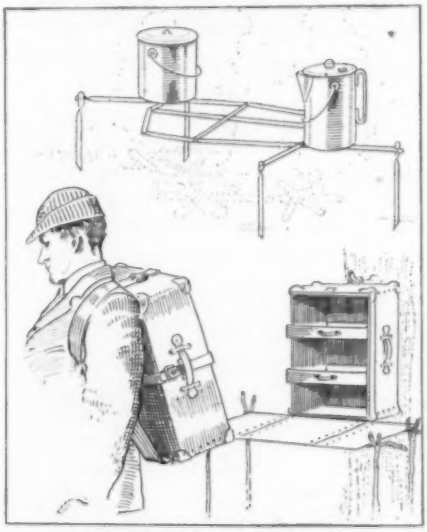
An Odd Helicopter

THREE-HANDED SHOP LIFTERS

The tricks by which a shop-lifter succeeds in plying her profession without being caught are many and ingenious. The most successful of all tricks is the false arm and hand, shown in one of the illustrations. While the shop-lifter's hands are apparently in sight of the store clerks, one is at work stowing away articles. The false hand is, of course, gloved and thrust through one of the sleeves. The real hand works under cover of the bodice and coat. The second illustration shows one of the pockets in which stolen articles are secreted.

CAMPING APPARATUS

Among the new articles devised to make camping-out as easy as possible, is a folding grate and a sportsman's



Folding Grate and Cupboard

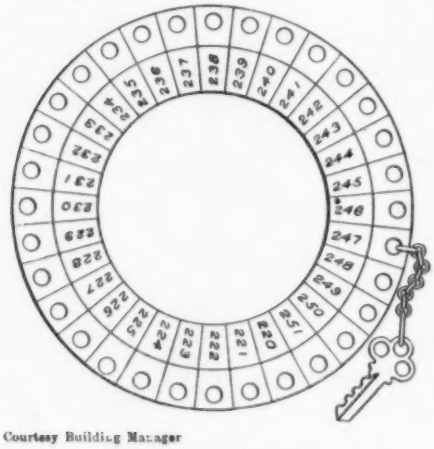
case. The grate consists of a collapsible iron frame supported by pointed legs which may be driven into the ground to give it greater steadiness. When extended, it provides room for a complete cooking outfit for six persons, and when folded it forms a compact package weighing 3½ lb.

The sportsman's case is a neat telescoping case with inside dimensions 24 by 16 by 8 in. It comprises a suitcase shoulder pack with pack straps, a cupboard, and a table-top 23 by 32 in. The detachable ends of the inner half, when unsnapped, slide into the outer half on cleats, and the released sides, hinged to the bottom, fall flat, making an excellent table-top. The cupboard and table-top does not add more than 4 per cent to the weight of the case and does not diminish its carrying capacity a particle.

KEY SYSTEM FOR LARGE BUILDINGS

One of the most satisfactory methods of handling the keys of a large building is the system here shown. Two sets of keys are made and placed on a brass ring about 8 in. in diameter. One set is kept in the manager's office, and the othe. set is used by the scrubwomen, janitors, etc. Whenever this set is taken out of the possession of the head janitor, a receipt is given, showing the time and person having same. In this way theft or disorder in a suite can be directly traced to the proper person. This illustration shows

a key ring for one floor. Each floor has a different set, and one janitor is made responsible for the floor while it is being cleaned.



Courtesy Building Manager

Key System—One Floor

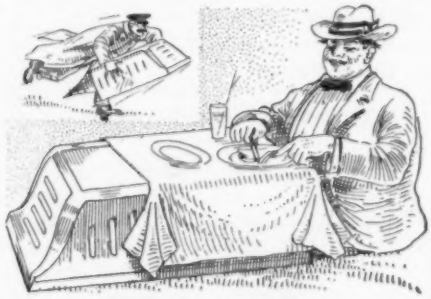
Many managers prefer the master key system, by which all offices can be opened by one key, but tenants object to it because it does not afford the protection given by the individual key system.

DINING CARS BUILT IN INDIA

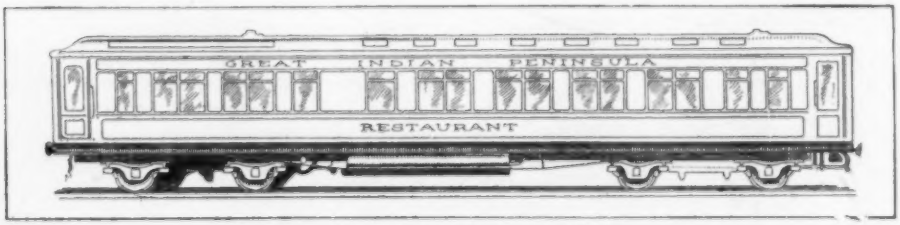
No finer dining car could possibly be turned out in the United States or England than has just been constructed and placed in service by the Great Indian Peninsula Railway of India. The car, which has been designed to accommodate 40 persons, is 64 ft. long 10 ft. wide, and, with stores on board, weighs 40 tons. The body of the car is framed in Burmah teak, braced with steel, with steel outer panels and lining of teakwood boarding. A heat-resisting layer of hard asbestos sheet is interposed between the lining and panels. The interior is finished in teak, rosewood and silky oak. The main saloon contains 10 tables and 40 chairs, the latter being upholstered in dark blue leather. This apartment is divided from the kitchen by a screen built up of black wood and brass, finished off with Oriental "purdahs."

A TABLE FOR THE FAT AUTOIST

The funny artist's greatest joy is a fat man, and this drawing is the result of a day of such enjoyment by a London caricaturist. It is freely admitted that the fat man finds the problem of eating a repast spread out on the ground somewhat difficult, but in this instance a resourceful chauffeur solved the difficulty by converting the hood of the automobile into a table.



Suggestion for Fat Men



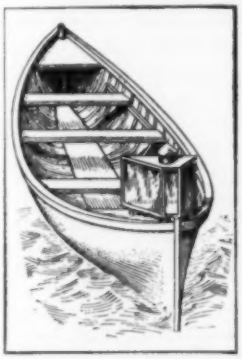
Built in India: Finished in Costly Woods

By fulfilling all conditions the "Lusitania" and "Mauretania" have won for the Cunard line a subsidy of $750,000 a year from the British government.

SHOP NOTES

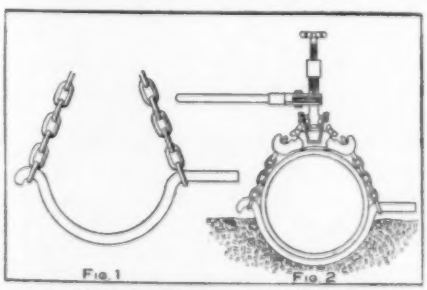
Boat Lamp for Fishing

When spearing fish along the shore ordinary bicycle lamps will give sufficient light, but if a boat is used it is necessary to provide a much larger light, says the Metal Worker. A metal frame can be made to fit on the bow of the boat, something similar to the one shown in the accompanying sketch. This lamp is made just the same as an ordinary street lamp, with the glass on three sides and a door in the back and a ventilator on top. The lamp frame is made large enough to put in two or three oil lamps.



Chain Hook for Tapping Large Mains

At a meeting of an association devoted to illuminating gas, a sketch was submitted to show a kind of hook used for tapping large mains. This hook is adapted for use on mains 16 in. in diameter and larger. The object of the hook is to save the necessity of digging under a large main for the purpose of applying a tapping device. The hook is shown in Fig. 1. Fig. 2 shows how it may be forced under the main and adjusted for attaching the tapping machine.



Hook for Tapping Large Mains

How to Make Water Coils for a Refrigerator

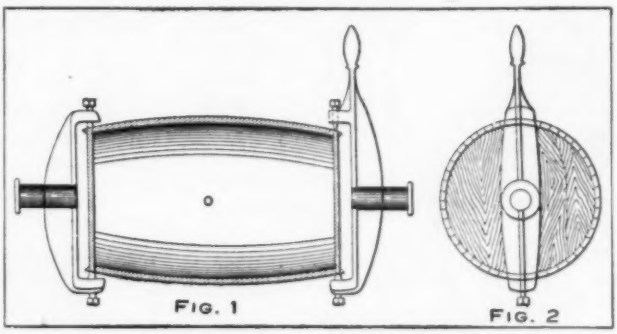
Finding it very hard to always have ice water in a small tank I sought a remedy for this so as to have ice water at all times. The measurement was taken of the interior of my refrigerator in the ice compartment. The tinner made a coil for me by using heavy block tin pipe of a size to fit inside a ⅝-in. hose. This coil was made with several turns of the pipe and fitted against the front part of the ice box. One end extended out on one side of the refrigerator to which was attached a hose connecting to the water faucet. The other end of the coil was soldered to a spigot that projected through the other side of the refrigerator. The coil is shown in the sketch through a broken portion of the ice box. By making the connection to the water supply with a

Coils Are Block Tin Pipe

hose the refrigerator can be moved without causing a leak.—Contributed by H. G. Head, Louisville, Ky.

Another Handy Shellac Barrel

The accompanying sketch, Fig. 1, shows another method of attaching axles to a barrel to be used for shellac. The clamps are made from cast iron and carry two ¾-in. set screws to be used on the outside of the chines of the barrel. There is nearly always an iron hoop at this place, says a correspondent of Wood Craft. The cast clamps have journals, and one of them also extends upward, forming a handle by which to turn the barrel when in use, as shown in Fig. 2.

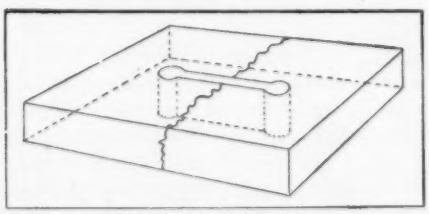


A Handy Barrel to Contain Shellac

The clamp is so formed that the center ·jection or journal will not be exactly in the middle of the barrel head when in position, but will be 1 in. above the center, so that the bung-hole or spigot will always be turned upward or toward the top as soon as the handle is free.

A Dumb-Bell Patch Kink

A simple application of a repair called a dumb-bell patch, that is not widely known, is shown in the sketch. The patch, or more properly, the link, gets its name from the resemblance it



The Dumb-Bell Patch

bears to the dumb-bell, and finds a field of usefulness in joining the parts of a broken casting that must be held as near as possible to their original position and have no screw heads or indentations in the finished surface, says a correspondent of Machinery. The broken pieces are put close together, and the place for the dumb-bell is laid out, after which the casting is drilled and slotted to these lines. A piece of steel is then carefully worked up to fit this opening, but with the distance from center to center of the round ends slightly less than the drilled holes for the dumb-bell. The dumb-bell piece is heated until it is long enough to be driven home, and while cooling it is riveted slightly to fill perfectly all around, after which the patch can be filed off flush. By this method the parts will be held together with considerable force.

When Water Gets into a Watch

A watch maker who has worked at the bench for over a quarter of a century gives this advice to watch owners who may accidentally get water into their watches.

Do not open your watch until you secure some sort of a dish into which to place it, and also enough kerosene to cover it all over; any old tin can will do. Open your watch case, both front and back covers, and carefully move it around in the kerosene until you have thoroughly filled it with oil. Allow it to remain in the kerosene until you can have it cleaned. It will come

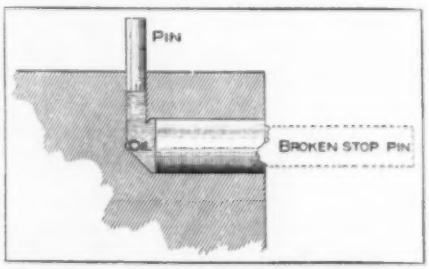
out of the oil without any of the parts rusting, thus saving much expense, and the watch.—Contributed by John W. Blinn, Spokane, Wash.

Steel Slugs Used in a Tumbling Machine

Steel slugs that are obtained by punching ⅛-in. holes in steel sheets of the same thickness make excellent material for use in connection with tumbling articles. While steel balls are very effective and will be largely used in the future the expense of the balls is the main objection which retards their use. The slugs have a sharp edge at first, but this soon wears off and they become round, says The Brass World. When they are in this condition they serve to smooth up the surface of rough work in an excellent manner. They are used principally in tumbling small articles made of sheet steel, but can be used to an advantage upon other classes of goods. They are used with a soap solution in order to prevent the rusting of the steel during the tumbling.

Removing Broken Stop Pin Shanks by Hydraulics

Some machines have a series of hardened stop pins and the breaking of these pins is a source of considerable annoyance to both operator and tool

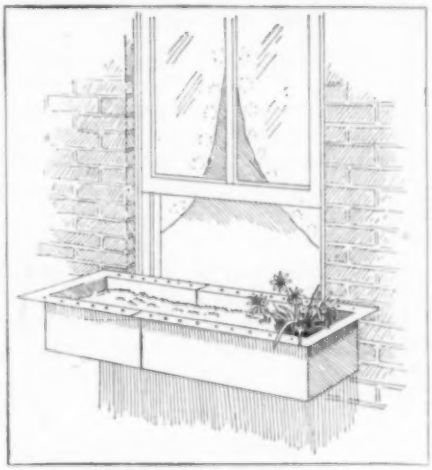


Removing Stop Pin

maker; perhaps not so much the mere breakage as the difficulty of removing the broken shank which is left in the machine. The usual method is to go after them with a chisel, damaging the machine to a great extent, says the American Machinist. Usually a small cavity is left between the end of the pin and the bottom of the hole. If this cavity is tapped, by drilling a hole into it at right angles and filling with machine oil, the broken stop pin may be removed by inserting a pin to fit the drilled hole and striking it a smart tap with a hammer.

An Adjustable Window Box for Flowers

A window box always has a neat appearance by exactly filling the space be-



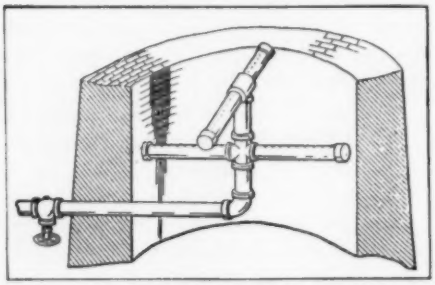
Made of Sheet Metal

tween the upright portions of the window frame. For the family that may move from place to place, or have occasion to use a box on different sized windows, the adjustable box as shown in the sketch will do duty without the least sacrifice of appearances. This box is made in two parts from sheet metal, one flanged to fit inside the other and small holes provided for locking at any point. The two parts can be made so the box will fill any space between 3 ft. and 6 ft., when they are connected.

It is not advisable to paint on exterior cement work until it has been exposed to the weather for about one year.

Home-Made Steam Blower

When it is necessary to have more draft, says Power, a steam blower may be rigged up in the stack as shown in the accompanying sketch. A 1-in.



For Increasing Draft

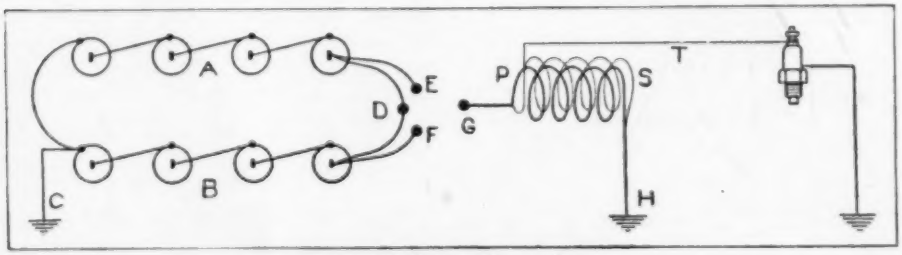
steam pipe is connected up to the center of the inside of the stack and an elbow put on turning upward. A short nipple is turned into this elbow and a cross screwed on its upper end. Run two short pipes out from the cross with ⅛-in. holes drilled along the top and with each outer end covered with a cap. Another short nipple is turned into the cross and a tee placed on its upper end with two more horizontal pipes extending out at right angles to the first two, as shown in the sketch.

Battery Connections for a Single Cylinder Gas Engine

The accompanying diagram shows how to wire eight cells for use with a single cylinder gasoline engine. Connect the two groups of cells, A and B, in series, using a common ground connection, C, for both, as shown at the left hand end of the sketch. Provide a three-point switch at D and connect the terminal of one group of batteries to point E, as indicated; then connect the second group to point F, as shown. By moving the switch lever from E to F the different sets of cells may be used alternately. Connect the carbon terminals of both sets of cells to point D on the switch. This will give a series-multiple connection enabling both sets of cells to be used together and will be found handy when they are no longer fresh. Connect the other end of the switch lever, indicated by the single point, G, to the primary, P, or low-tension side of the induction coil. Both the primary, P, and secondary, S, windings of the coil must be grounded at H, as shown, this usually being made in the form of a single connection by coil makers, says Motor Age. A high-tension cable, T, is led from the secondary of the coil to the plug. The ground connection indicated on the latter is taken care of by its insertion in the cylinder.

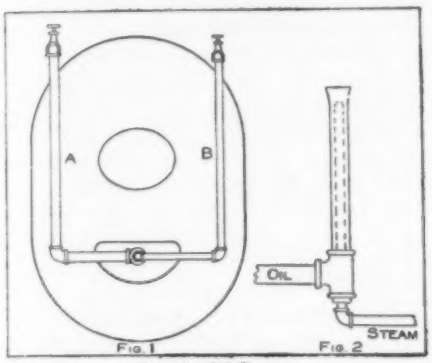
A Home-Made Oil Burner

The accompanying sketch shows the construction of a home-made oil burner for traction engines. It is automatic when regulated, as the high pressure of steam will cut down the feed of oil, says a correspondent of Thresherman's Review. The oil pipe, A, is 1 in., while the steam pipe, B, is ⅜ in. in diameter and the arrangement of the piping, which is attached on the rear end of the boiler, is shown in Fig. 1. The oil is fed by gravity and no pressure is put on it. The burner, as shown in Fig. 2, leads straight into the ash pit



Details of Battery Connections

through the center of the lower door, Fig. 1, and is pointed slightly downward. The grate bars are taken out and the firebox lined with fire brick and arched over just under the flues. The object of removing the grate bars is to get all the heating space possible. A slot should be cut in the lower door to close the draft, and should be made from the bottom up so that the door can be opened. The oil feeds into the burner from the outside of the steam

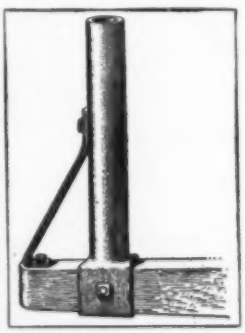


Simple Oil Burner

pipe. The steam pipe does not extend to the end of the large pipe by about 2 in.

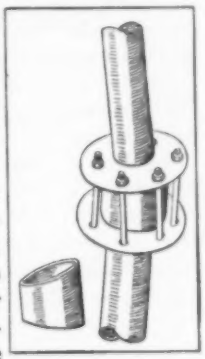
How to Iron Bolsters

It is always well to have things ready for busy times, says a correspondent of Blacksmith and Wheelwright. How handy it is on a hot summer day, when you are overcrowded with work, if you can take from the shelf a finished article and hand it to your customer. It is almost like finding the money, and you can go on with your work undisturbed. During the slack times, make up different kinds of articles that there will be a demand for when the rush comes. I will give my way of ironing bolsters. Take a gas or water pipe $1\frac{1}{2}$ or $1\frac{3}{4}$ in. and split it in the shape shown in the sketch. You can bend the ends under the bolster $\frac{1}{2}$ in., which makes it stronger. Enough pipe can be taken from the scrap that is bought from the farmers. One man can make four bolsters in a day in this way.



Temporary Connection Between Pipes Not in Line

When two lines of pipe are not in proper alignment with each other and are to be connected, pull the pipes as near in line as possible and place between the flanges a piece of pipe of a size larger than the lines to be connected and shaped as shown in the sketch. This piece should be beveled to fit between the flanges which do not face each other perfectly, says a correspondent of the Metal Worker. By cutting the pipe straight on both ends it can be used in an emergency where one pipe is a few inches short and cannot be easily replaced. Where a number of machines of different sizes are to be connected and tested it is well to have several short pipes of different lengths, so as to make it unnecessary to change the piping for every machine.



A Backing for Letters on Glass

A backing-up for letters on glass that needs no varnish may be made as follows: Equal parts of tube lead and fat oil should be mixed, to which should be added a tablespoonful of litharge, says Signs of the Times. Color with green or yellow tube color to suit, and strain through fine bolting cloth. If the mixture is too thick after straining it should be thinned with boiled oil.

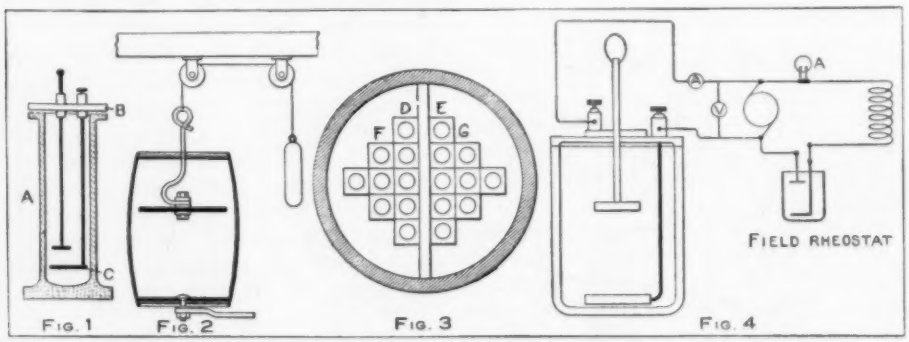
Dynamo Testing Rheostats

The apparatus which is used to make full-load tests of dynamos in electric plants is known as the water rheostat. These tests are made from time to time, and generally at the time when it is not possible to use the regular working circuits. In testing small apparatus the form of rheostat shown in Fig. 1 is used. This consists of a large glass jar, A, with a rubber-cover piece, B, on the top containing two binding-posts for the connections. One binding-post is connected to a wire which goes down to the bottom of the jar and fastens to a copper disk, C. The other terminal is connected to a movable rod. The liquid used is water mixed with a few drops of sulphuric acid. This form of rheostat will stand about 20 amperes, the jar being about 14 in. long by 3 in. in diameter.

In the ordinary electric plant it is necessary to have a larger rheostat. This can be made from an oil barrel, but constructed on the same principle. This form of rheostat is shown in Fig. 2. Water is used in this apparatus and mixed with a solution of salt or sal-ammoniac. This rheostat has a capacity of about 100 amperes, the barrel holding about 40 gal. of water.

One of the defects in water rheostats is the heating of the water after the rheostat is in use for a short time. This heating effect can be removed by introducing a series of pipes in the rheostat which have cold water running through them. When this form is used a tank is employed with the rheostat attachment on one side of the tank and the pipes on the other. The pipes should be of copper, as this metal is a good conductor of heat.

Another form of rheostat, known as the submerged rheostat, gives more constant resistance than any of the other types. The rheostat is made up of a certain number of coils of iron wire placed in wooden compartments, one coil generally taking up two compartments, one-half coil in each. The compartments are placed in a barrel of water. The top of the submerged rheostat is shown in Fig. 3. Compartment D is connected with E, F with G and so on. This form of rheostat will stand from 500 to 1,000 amperes. The diameter of the coils should be about 1½ in. Two-thirds of the coils should be about 75 ft. long—using No. 14 gauge wire; the remaining coils on an average of about 70 ft. of No. 16 and 18 gauge wire. When in use the coils may be connected in series, parallel or series-parallel. The capacity of the barrel is about 40 gal. When using this form of rheostat it is best to have the water changing at all times so as to maintain a constant temperature. Any one of the rheostats is placed in connection with the dynamo for a test, as shown in Fig. 4.—Condensed article from the Practical Engineer.



Testing Rheostats for Small Electric Plant

One barrel of good cement will lay 100 sq. ft. of ceramic floor.

Driving Underground Pipes

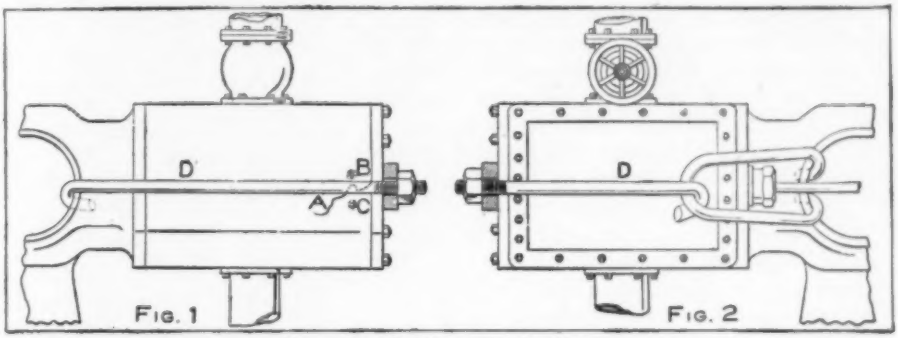
A building about 600 ft. long was to be equipped with six drinking fountains in a line in the center of the building. The floor was of pine and hard maple laid on about 8 in. of cinders, packed down tight, under which was sandy soil. The problem was to run a main without taking up the floor. Large holes were cut in the floor where the fountains were to be connected to the main and the sand tunneled out ahead far enough to admit an 18-ft. length of 2½-in. pipe. A rope 20 or 30 ft. long was securely fastened to the rear end of the pipe. A hose was attached to the same end. Then with one man at the hole to steer the pipe and three or four laborers to pull on the rope the water pressure was turned on and the pipe was easily pushed through the soft sand as the stream of water bored a hole in advance.

The pipe was started in with the coupling end first to avoid injury to the thread. When the length was all in, another length could be coupled on and the operation repeated. Smaller holes were cut in the floor at intervals of 30 or 50 ft. to see that the pipe was keeping the proper course. This operation was repeated from each fountain location until the main was run.

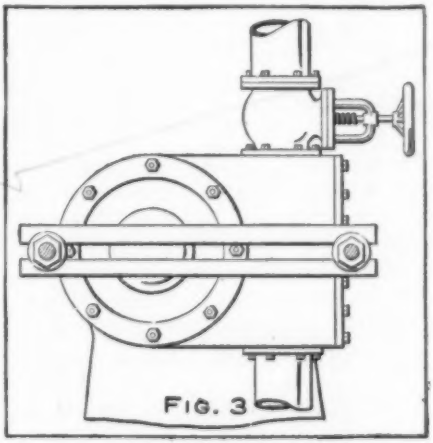
Statistics collected by the government indicate that the nation has consumed about 7,000,000,000 tons of coal up to the present time. Nearly half of this has been used in the last 10 years.

An Emergency Repair on a Cylinder Head

The accompanying cuts show how a high-speed engine was repaired to keep it running after the damages caused by a broken piston. When the piston broke it drove the cylinder head loose from the cylinder, which also made a large crack along the side, as shown at A, Fig. 1. Studs were put in at points B and C and the crack filled with litharge and glycerine, says Power. A link was then shrunk over the studs and 2-in. rods, D, were put on, with two 2-in. bars placed across the head, as shown in Fig. 3, and the nuts tightened up. Fig. 2 shows the steam chest side and the method of placing the rods and links so as not to interfere with the valve rod. It took some time to complete the job, but as the new cylin-



Emergency Repair of Cylinder Head



Repairing Cylinder Head

der did not arrive for two months, time and money were saved.

Cement for Glass and Metal Tanks

An aquarium cement that has been thoroughly tested is made of 1 gill each of litharge, fine white sand and plaster of paris; finely pulverized rosin 1-3 gill. Mix thoroughly and make into a paste with boiled linseed oil to which dryer has been added. Beat it well and let it stand for 4 or 5 hr. before using, as it will lose its strength after it has stood for some 15 hr., says the Metal Worker. Glass cemented into its frame with this cement is good for either fresh or salt water.

For mining purposes tamping material is much cheaper than dynamite Dry clay is the best material, although crushed stone or screening mixed with clay makes good tamping. Damp sand is also very satisfactory. A well tamped charge requires less explosive.

Waxed floors that are not worn may be cleaned with a cloth that is damp with either benzine or turpentine.

A Boathouse Houseboat

By Custer Ingham, in Motor Boat

A question of a suitable boathouse is sometimes a perplexing one, and perhaps the idea which is brought out in this article will help to solve the problem. On the rivers and lakes where the disturbing influences of tidal waters are not felt, boathouses are common, and it is an easy proposition to build one which will answer every requirement. Even on tidal waters boathouses are in use, but they are not very convenient, owing to the rise and fall of water every twelve hours.

One way of building a satisfactory boathouse is by the use of barrels that support a platform which embodies the accommodations of a float, boathouse and of a houseboat all in one, as shown in Fig. 1. The first consideration is to form two rows of empty barrels, held in line by three stringers, as shown at B, Fig. 2. If you wish to build only a float, your work is virtually at an end when you have the barrels arranged in line. Any lumber is good enough to construct a platform and anyone can do the work. But the idea can be carried much farther. For instance, to make a boathouse have the two rows of barrels sufficiently long, so that they will extend beyond the space occupied by the boat and leave plenty of floor space at the inboard end of the house to tie and brace together the

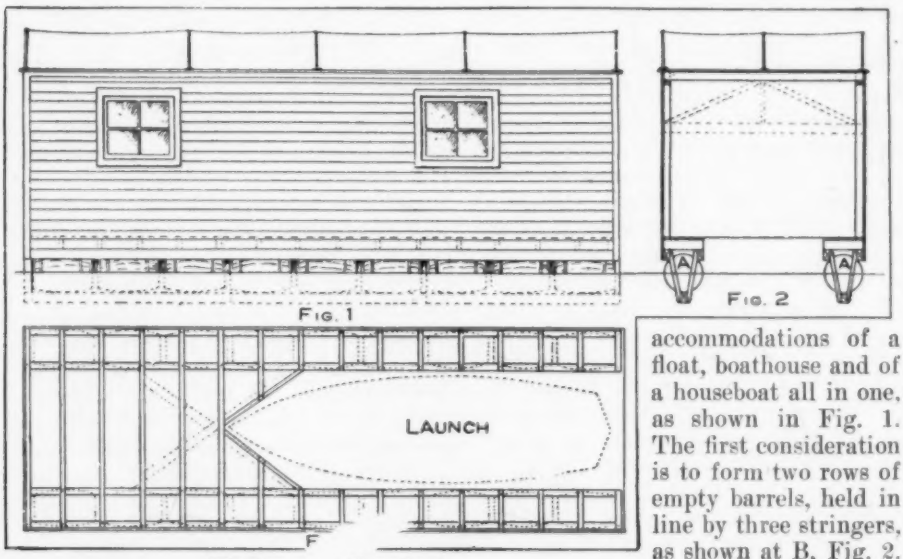


Fig. 1

Fig. 2

The Boat[illegible]e Houseboat

two lines of barrels accurately and firmly. By building a platform at one end and around the sides leaving a cutway space between the barrel rows for a motor boat, as shown in Fig. 3, and by building a roof over the entire contrivance, a very effective floating boathouse is obtained. If one wishes, the place unoccupied by the boat can be used as a store room for keeping tools and odds and ends, or it may be fitted up as neatly as the owner may desire, with berths and the like. Thus you will have not only a boathouse but likewise a houseboat, and when the motor boat is firmly made fast in its place, you have a motor houseboat which is capable of traveling anywhere in good waters.

It is an important thing to remember, to place each barrel so that it rests with its bung-hole up and with a removable board in the floor above, so that the barrel can be pumped out in case it should leak. If a careful selection of barrels is made and only empty linseed oil barrels are secured, or something just as good, there will be little danger of leakage.

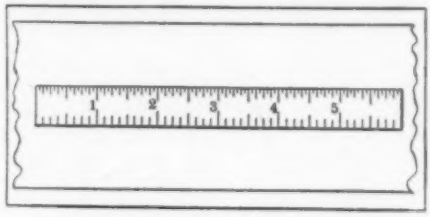
In building this boathouse, or houseboat, care should be taken to bolt the cross beams to the stringers securely to the shore end, as they are the only beams that extend entirely across and must, of course, stand the strain of twisting. If a roof is built, this strain can be carried partly by the roof of the house, if the roof beams are diagonally braced to the upright posts, and the upright posts likewise should be trussed.

A Bronzing Liquid for Stencil Work

Stencil the design on the wall with good wearing body varnish, and apply the gold bronze; this will give a very bright luster. Rub the bronze with a wad of cotton. If it is desired to use the bronze in liquid form, mix the bronze with gum Arabic water, making the gum water quite thin or weak with gum, says the Master Painter. Or the bronze may be mixed with rubbing varnish thinned with turpentine.

A Steel Rule Fitted to a Draftsman's T-Square

The blade of the T-square is recessed to receive a 6-in. flexible steel scale, as

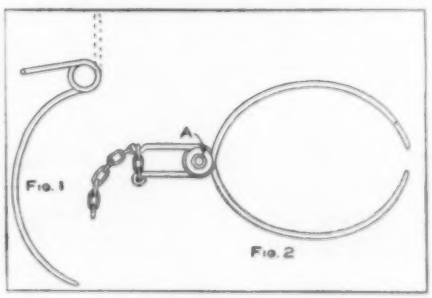


Improve Your T-Square

shown in the sketch. Shellac is used to hold the scale in place in its recess. The dividers and compasses may be set directly from this scale, says Machinery, and the annoyance of looking for an ordinary loose draftsman's scale is avoided. Scales are graduated to 32nds and 64ths of an inch. This will make it convenient for fine work.

A Rake Tooth Cornstalk Holder

Secure two rake teeth, as shown in Fig. 1, from an old hay rake and after



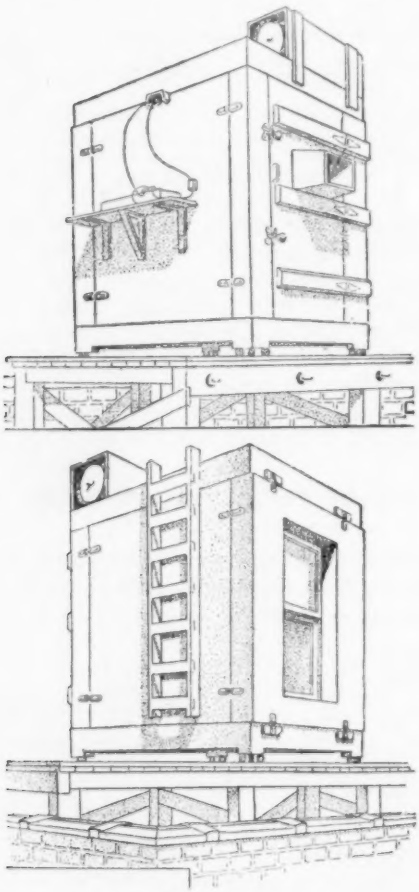
To Hold Cornstalks

heating bend the ends of them straight as shown by the dotted lines. Place the teeth together opposite each other and fasten them with a bolt and large washers, using a round wood plug that will just fill the hole in the circle of the spring, A, Fig. 2. When heating the

ends and bending them make a hook on one end and an eye on the other in which to attach a chain to hold the holder together around the stalks while tying.

Testing Windows for Air Leakage

Air leakage around windows was discussed to some length at a meeting of the American Society of Heating and Ventilating Engineers, and one of its members agreed to pursue the investigations farther and to submit results of his work at a subsequent meeting. The location selected for making these tests was on top of a lofty building. This was done in order to subject the windows to wind conditions that more nearly averaged the conditions ordinarily to be found. The device used for the test looks very much like a good-sized refrigerator, but it is made with the intent of having a small room into which is placed one window, with the walls designed to resist the flow of heat so that the loss will be only through the window glass and around the window casings and frame.



Two Views of Testing Box

The air within the room was warmed by using a small electric radiator and the test was made by registering the amount of current used in a certain length of time, and by knowing the contents of the room, a thermometer registers the amount of heat taken up by the confined air, provided there is no leakage.

The construction of the house is in sections, the four sides, top and bottom being in separate pieces which can be joined together after it is taken to the roof. This allows it to be taken through a small trap door, or taken to different localities.

Cutting a Hole Through a Concrete Dam

A circular hole was cut through a concrete dam for a flood waterway by using an air plug drill and 1½-in. flat chisels. The dam had been in use 10 years and was built of concrete composed of crushed shale and Portland cement. The concrete was soft and tough rather than hard and brittle, says a correspondent of Engineering News. Chipping with 1-in. flat chisels did not work satisfactorily, but the wider 1½-in. chisels seemed to be suited to the material.

When the hole was cut the dam was 16 ft. thick, the invert being 2½ ft. above the rock creek bottom. The hole when completed is 5 ft. 4 in. in diameter for the downstream, 13 ft. of its length, and 6 ft. in diameter for the last 3 ft. near the upstream end of the dam. The hole was cut at an average rate of 1 ft. per 9-hour day, using a single drill with air pressure at 70 lb.

Two laborers alternated in holding the drill and with plenty of sharp chisels at hand no delay was experienced.

The chisels were sunk into the concrete until the repeated blows of the plug drill hammer caused a piece to break out. From a few seconds to 5 or 10 minutes were necessary to break out a piece of the concrete. As the men became accustomed to the drill they used at times a wedging method by sinking two or three chisels into the concrete along a line calculated to loosen a large piece containing perhaps ½ cu. ft. of material. This method worked well, especially when the lower portion of the hole was advanced ahead of the upper portion.

Tile Bench Construction for a Greenhouse

The accompanying sketch shows how to make a tile bench to hold soil for flower beds in a greenhouse. The bottom of the bench, as shown in Fig. 1, is made from tiles split in the middle. These tiles are of special make for floors and are shown in Fig. 3. When cut in the middle each half will be 2 in. thick, 24 in. long and 12 in. wide. As tile posts and cross pieces are now made the bench can be held up by this construction as shown, but ordinary 2- by 6-in. wood may be used for this purpose, says a correspondent of Florists' Review. When wood is used for the supports all joints of the tile that is resting on the supports must be coated with mortar to keep the drip from the wood. The tiles make a nice level surface, and also give perfect drainage. Tile has been known for years to be the best material on which to grow plants on account of the way in which it allows the air to get at the soil and the roots of the growing plants.

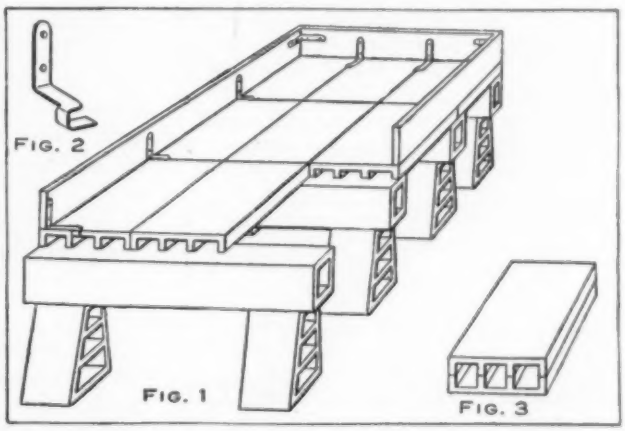
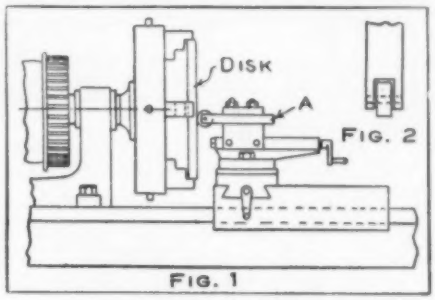


Fig. 2 shows the construction of a little clip made from metal which attaches on the tiles and forms a bracket to fasten the side boards of the bench.

A Lathe Tool for Truing Discs in a Chuck

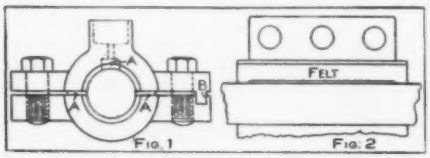
A device for truing up any disc or plate in a lathe chuck is shown in the sketch. The tool, A, Fig. 1, consists of a piece of steel about ¾ by 1¾ in., having a slot at one end to take a hardened steel roller $\frac{5}{16}$ in. long and 1¼ in. in diameter. Figure 2 shows an enlarged view of the tool. The disk is trued up by placing it in the chuck and tightening the jaws slightly, set the work revolving and bring the roller to bear with light pressure, and in a few revolutions the plate will be found to run true, says the Model Engineer. This method is easier than chalking and then tapping with a hammer.



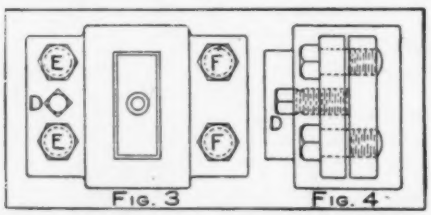
Handy Lathe Tool

A Dust-Proof Bearing

It is very important to have such bearings on wood-working machinery that the wear can be taken up without taking off the bearing cap to remove the liners. A bearing that is designed to be dust-proof and have this adjustment is shown in the accompanying sketches. The end elevation is shown



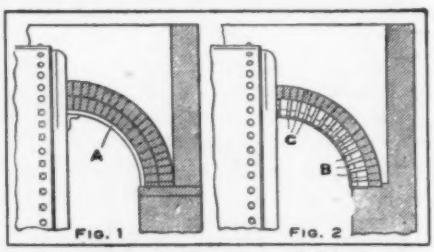
in Fig. 1 and the cross section showing the felt cut out and fitted against the shaft at each end is shown in Fig. 2. The cap has a projection, B, Fig. 1, that is a good fit into the groove in the lower half of the bearing. Brass or iron liners of about 26 gauge are placed under this projection to make up the thickness equal to the space left between the cap and bearing. This space next to the shaft is fitted with felt, same as shown in Fig. 2. The cap rests on the projection, B, Fig. 1, and setscrew, D, Figs. 3 and 4, and just tight enough on the felt to keep it in place. All that is necessary to take up the wear is to slacken the setscrew D and tighten the capscrews EE and FF.



When the bearing becomes worn so that it is necessary to remove liners then loosen all capscrews and remove as many liners as desired, with a piece of tin, endwise, and the bearing may be adjusted in the same manner as stated above, says the Wood-Worker. In Figs. 1 and 3 it will be noticed the cap is drilled out opposite the oil hole about $\frac{5}{8}$-in. in diameter and deep enough so that the piece of felt will rest tightly on the shaft. The oil will filter through the felt, preventing dirt from working through the oil onto the shaft.

Burned-Out Grate Bars Used for Arch Supports

The rear arch of a 36-in. by 12-ft. return flue boiler was in a decidedly shaky condition. The arch was constructed, as shown in Fig. 1, with 1-in. square iron supports, A, bent to shape with one end resting against the head of the boiler, and the other end supported on the back wall, says Power. These irons did not last long and the brickwork soon gave out. The grate bars were placed as shown at B, Fig. 2,



Utilizing Grate Bars in a Brick Arch

with fire-clay, C, between them and a covering of bricks on top. This construction of an arch has stood the heat longer than the brick and square iron bars.

Flexible Wire Connections to a Spark Plug

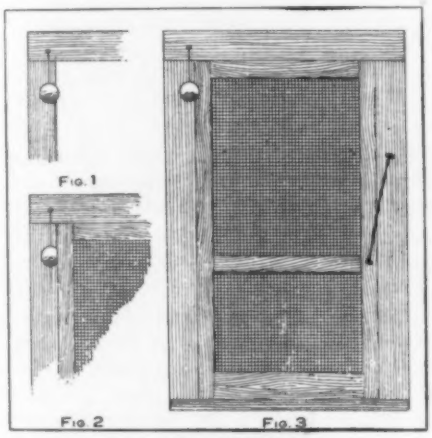
The vibrations of the wire causes many a break in the connections to spark plugs. A very simple way of making a good contact, yet securing one that is flexible, is to make a coil of wire around a lead pencil that will be about 3 or 4 in. long. The end of the coil thus made may be soldered to the secondary wire and the other end of it either soldered to a terminal or shaped to meet the requirements of the spark plug. A flexible end made in this manner will permit any amount of vibration without breaking.

Preventing Cement from Sticking to Molds

One of the rock-faced plates on our cement block machine had a spot where the cement would stick to the face of it and leave an imperfect impression. As this plate had the best pattern we tried numerous methods to get the cement to leave the pattern in a perfect condition. At last we applied a thin wet cloth to the plate and then the block came away with a perfect impression. — Contributed by Lester Bellamy, Belmont, N. Y.

A Simple Screen Door Check

All that is required for a screen door check to keep it from slamming is a small rubber ball that can be purchased



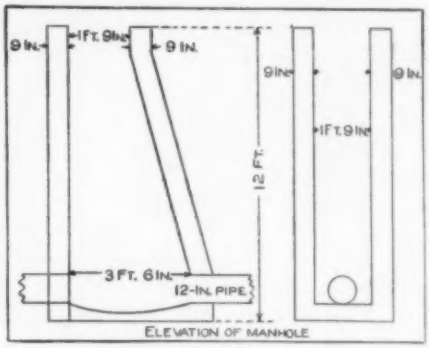
Door Check

for a few cents. A stout cord is attached to the rubber ball and hung on a nail driven into the door casing. It is hung at such a point that only a portion of the ball extends in the doorway, as shown in Fig. 1. Fig. 2 shows the door striking the ball, and Fig. 3 the ball swinging clear of the door when the door is closed.

Hot water will remove the grease and dirt from an engine better than can be done by wiping with waste. The hot water can be secured by attaching a hose to the overflow of the injector.

Cost of Concrete Manholes

The cost of concrete work is variable. Each unusual condition entering into the work has its own influence. Sometimes it is the cost of the material, again it is the cost of erecting the forms, says Canadian Cement. Herewith is given an example of actual costs and a detailed statement of how the costs are distributed. From the



Forms for Manhole

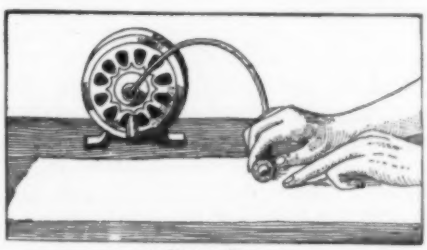
sketch it will be seen that nothing very unusual in the shape of forms was encountered, the great waste being that the lumber used was so cut up that it could not be used again.

Lumber for forms	$ 9.00
Labor on forms	22.75
Sand and gravel	4.00
Cement at $2.25 a barrel	11.00
Labor on placing concrete	2.92
Total	$49.67

Total cubic yards concrete in manhole, 4.08 cu. yd., which made the cost of concrete $12.17 per yard.

Power-Driven Eraser

An electric motor-driven eraser is a new device adapted for use in a



A Motor Eraser

draughting room. It is far superior to the hand eraser, as it will make absolutely clean erasures, owing to the high rate of speed at which the eraser wheel revolves, says Popular Electricity. The eraser wheel is driven with a flexible shaft by a small motor, which is easily moved from table to table in the draughting room. A flexible cord with a plug is provided for attaching to any incandescent lamp socket.

A Substitute Reamer

Some time ago I had to bolt some plates on a machine with ⅜-in. bolts and all the holes were drilled too small by about $^3/_{32}$ in. As a drill or reamer was not at hand I took a three-cornered file and inserted the tip in the chuck of a brace and put the heel into the holes in the plates and turned the brace. It was surprising how rapidly the holes were made larger.—Contributed by Dudley F. Clapp, E. Windsor Hill, Conn.

Broken taps may be removed by pouring hydrochloric acid into the hole around the tap, says the American Machinist, and leaving it stand about 4 minutes. Enough of the tap and the edge of the hole will be eaten away to loosen the tap.

How to Make a Camper's Kitchen

By Geo. B. Wrenn

Portable wooden buildings made in sections that can be readily taken apart and put together again have been in great demand in the last few years by campers who are beginning to realize the necessity of more substantial camps than are secured by the use of tents. Especially is a wooden building desirable for kitchen use as it will not be easily upset by strong winds and can be locked whenever necessary.

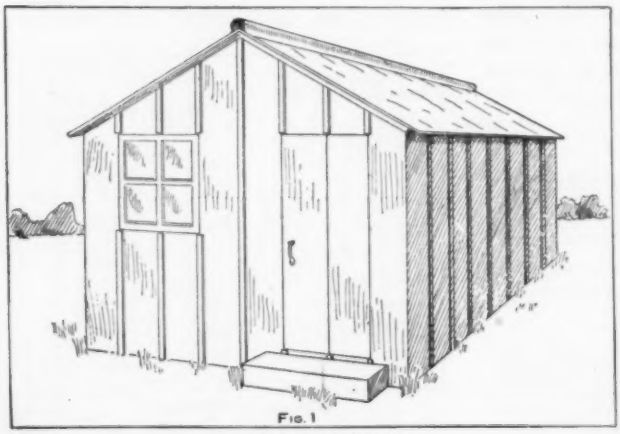


FIG. 1

The Camper's Kitchen

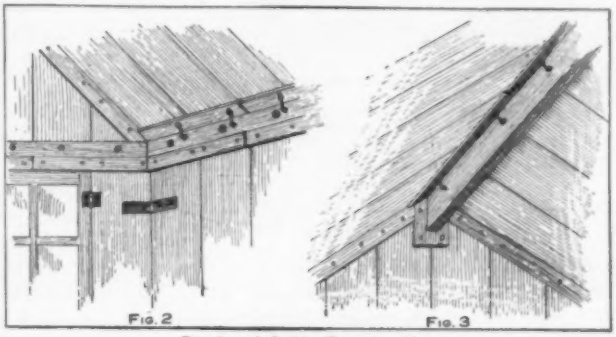
It is the purpose of this article to describe in detail the construction of a portable building, suitable for a kitchen for the average size camping party, which when set up will have the appearance of an ordinary building, the arrangement of sections not being apparent from the outside. The building as shown in Fig. 1 will be about 8 ft. square, 9 ft. high at the ridge and 6 ft. high at the eaves.

The two low walls under the eaves are made up of boards 1 by 12 in., and are 6 ft. long. Each section consists of two boards fastened together at each end with strips of oak 1 by 2 by 24 in. Thus each section of the low walls are 2 ft. wide and 6 ft. long, and there are four sections in each wall. The four sections are connected together at top and bottom with long, narrow strips of boards 1 by 2 in. and about 8 ft. long, which are fastened to the sections with ⅜-in. carriage bolts. These narrow boards should be placed directly on top of the oak strips that connect the boards in each section.

The walls are connected with thin iron bars, about 8 in. long, bent to fit into the corners, as shown in Fig. 2, and fastened to the walls with carriage bolts. A cheap method is to use screen

door hooks, but these sometimes tear out of the wood when the building is being connected up.

The front and rear walls contain the door, windows and gable ends and are not quite so simple in construction as the other walls. They are made up with two boards in a section and four sections in a wall. Bearing in mind that the building is to be 9 ft. high at the ridge and 6 ft. high at the eaves you will find that you can make up the boards for these walls from 16-ft. lengths, as a board this length will make the longest and shortest board, and another board this length can be sawed to make the next to the longest and the next to the shortest board, etc.



Roof and Gable Construction

The long, narrow boards connecting the sections of the front and rear walls are fastened in such manner that when the building is erected the top of the upper strip is 6 ft. from the ground and the top of the lower strip is 6 in. from the ground. The reason for elevating the lower strip is that if it is ever desired to put a floor in the building, 2 by 4-in. oak beams, about 8 ft. long, can be used and made to rest on the oak strips at bottom of side walls, and on these the floor boards can be placed with the ends resting on the oak strips at the bottom of the front and rear walls.

The slamming of the door shut often will gradually cause the front wall to bulge out slightly, enough in time to cause the oak strips at bottom of front wall to be drawn out from under the floor boards. To avoid this a strong wire should be run under the floor connecting the front and rear walls at about the middle, and this wire stretched tight.

Space for the door and windows should be cut into the sections in such a manner as to be about half in one section and half in an adjoining section, and thus no section will be cut in two.

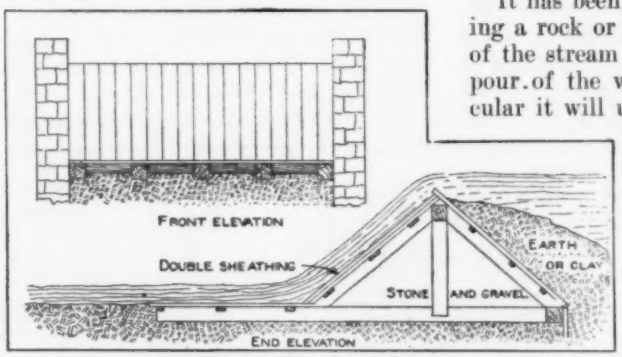
The hinges for door and windows should have loose pins that can be removed and the door or window taken out when it is desired to move the building.

The front wall should contain a window, but this could be put in the door if desired and the door placed in the middle of the building. A small window should also be arranged in the rear wall that can swing open, thus allowing for ventilation. By opening this window and the front door and window a draft will be immediately started that will keep the building cool in the very hottest weather.

At the peak of both front and rear wall a mortised block is bolted in which rests a 2 by 4-in. oak beam, extending from front to rear wall and supporting the upper end of roof sections, as shown in Fig. 3. The lower end of the roof sections rests on the low side walls, and the oak strips connecting the boards of the sections are so placed that when the building is put together the strips at the lower end of roof will be just inside and touching the side walls, thus preventing the roof from sliding off. Screen door hooks are used to fasten the roof to the beam at ridge and to the side walls.

The peak of the roof is covered with a ridge roll to keep out the rain. This should be fastened down with short nails so that it can easily be torn off when desired to move the building. The space between the boards in the

sections should be covered over with lath and also the space between the sections, but in the latter the lath of course can only be nailed to one of the sections, but in such a manner as to lap over the next section. In like manner lath should be nailed over the cracks in the walls. If the roof boards are free from knots and cracks and are given several coats of good roof paint each season the roof will not leak.



Flood and Ice Proof Dam

Expanding a Disk with Electric Flat Irons

A new crankpin 6 in. in diameter had to be replaced on the high pressure side of a 500-hp. cross compound engine. The pin had a taper of 1-64 in., and had to be fitted tight into the disk, which was 5 in. thick, with a 12-in. shaft. The problem was to expand the disk to receive the pin. Several heating units from 6-lb. electric flat irons were grouped around an iron core, $3\frac{3}{4}$ in. in diameter, and placed in the 6-in. hole in the crank disk. It required 4 hr. after the current was turned on to expand the disk sufficiently to allow the crankpin to slip in.

Men's hats may be stiffened by using a mixture of 1 part borax and 5 parts shellac gum.

One gallon of paint will cover about 600 sq. ft.

A Flood and Ice Proof Mill Dam

It has been discovered that in building a rock or stone dam where the bed of the stream is not solid rock and the pour of the water is almost perpendicular it will undermine and the breast will go away in pieces. Also, logs and ice going over will come back against the breast and batter it to pieces finally.

A dam built like the one shown in the sketch will remove a number of obstacles that are very destructive to mill dams, says a correspondent of American Miller. Anything passing over the breast of this dam will pass off smoothly and never come back against it. There is no possible chance for undermining from the pour of the water. The abutments at each end of the dam are built of stone and cement, and are high enough above the crest to take the entire stream at the time of a flood. Filling with stone and gravel under the sheathing and filling with dirt on the up-stream side puts the weight well up stream and makes it perfectly secure.

The dam is built by sections, each section completed and spiked together and lapping the mud sills as done in framing a barn. This dam is so tied together that the entire structure would have to all go at once to be washed out.

In building a dam the breast should be set square with the stream, if possible, and the filling above should be good ground or clay, but no stone, as stone gives a rough surface. The top of the filling should be as compact and smooth as possible.

Regulate your fire by the damper and not by the ash-pit doors. Never open your fire doors when it can be avoided, says Power. To keep them open longer than is absolutely necessary is injurious to the boiler and wasteful of fuel.

One Way to Make a Concrete Fly-Wheel

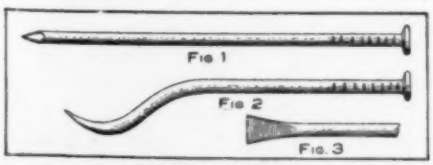
In South Africa iron is very expensive on account of the railway and ocean carriage. An interesting experiment has just been made in connection with the Rand water works. Some of the water is pumped from artesian boreholes, the pumps being of the bucket and plunger type, driven by gearing.

On the crankshaft is a fly-wheel, 14 ft. in diameter. The boss of the wheel is cast iron, bored and tapped for 4-in. piping. These arms of piping were screwed into the boss and rusted fast, says a correspondent of Power. At the outer end of the arms a sheet iron rim or ring, ¼ in. thick, was secured by nuts, and a second ring to form the outer periphery of the wheels was held by bolts and pipe distance pieces. The space between was filled with concrete reinforced by four rods of ¼-in. iron laced in between the distance pieces.

The rim is only 13 in. deep and as it only rotates at 20 turns a minute, it is perfectly safe. The concrete was made of rock crushed to pass through a ¼-in. mesh, 1½ parts; rock crushed to pass through a 1-in. mesh, but not to pass ¼-in. mesh, 3 parts, and cement, 1 part. Such a use of concrete is decidedly novel and, it appears, sound practice under the circumstances, for the fly-wheels run at slower speed than the motors and there is no serious risk of overspeed.

How to Make a Thumb Tack Lifter

This thumb tack lifter is made from an ordinary 60-penny wire nail, Fig. 1,

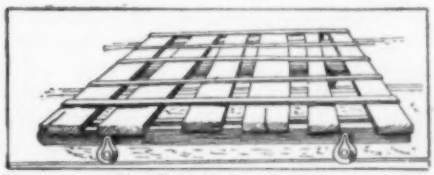


Handy Tack Lifter

which is about 5 in. long. Bend the nail as shown in Fig. 2 and flatten the point so as to make it about ½ in. wide, Fig. 3, and grind the edge quite sharp. The head of the nail may be used for driving the tacks. The bend will prevent the lifter from rolling off the drawing table.

Piling Lumber for the Dry Kiln

Proper care must be taken when piling lumber on the tracks for the dry kiln, else the pieces will come from the kiln crooked and warped in various shapes so as to make them unfit for some



The Foundation Planks

kinds of work. If there is mixed lengths, it is well to sort the lengths into piles as carefully as you would on the yard, says the Wood-Worker. A common fault with most kiln piling is that of using two or three trucks for lumber lengths without sufficient piling foundations. It is difficult to keep lumber from sagging and warping between the rests when this is done. The accompanying sketch shows a dry-kiln piling foundation from which can be seen at a glance the means adopted to get more piling strips under the lumber. There are three trucks, and without the foundation planks on it there would be only end rests and a center piece for the lumber. The arrangement shown is to put 2-in. planks on the trucks and then arrange piling strips on this, so as to make only a short distance between each rest for the lumber to prevent its sagging during the process of drying. This plan of a piling foundation was used for kiln-drying oak lumber that had to be thoroughly dried just like oak for furniture factory and cabinet work, and with its use the lumber came out in good shape. The heat in the kiln should be so regulated that the drying power is concentrated on the body

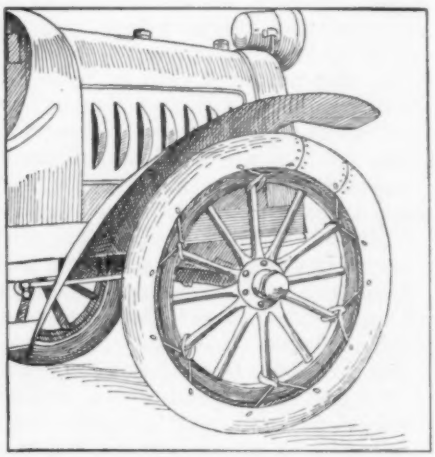
of the lumber and not on the ends. By so doing there will be little or no checking at the ends.

Automobile Tire Protector

The rough and rutty road conditions of the country call for more than ordinary protection of automobile tires. The sides that form the rough walls of the ruts tear the rubber from the fabric and causes frequent blowouts. One of the best protectors for tires can be made from discarded casings not completely worn out. The old casing is cut in two, cross section, choosing an injured part if there be one, so that it may be cut off from one end. The beads which fit into the flanges of the rim are then cut off with a stout knife, and the protector is placed around the tire that it is intended to protect. If the old casing has not been shortened to get rid of some bad portion the protector will lack about 4 in. of surrounding the wheel, which may be filled in with a small section of another old casing. This short piece may be fastened securely by using several wire belt links, with the points on the outside, to unite it to the old casing.

Opposite every other spoke a mark should be made on the sides of the old casing, beginning with the spoke which should be in the middle of the small section; 3 in. on either side of these marks and about $\frac{3}{4}$ in. in from the margin holes should be made through the walls of the old casing with a $\frac{1}{4}$-in. punch, such as used by harnessmakers for heavy leather. Pieces of No. 9 galvanized wire 12 in. long are bent like a wide open V, and hooks $1\frac{1}{2}$ in. long bent on the ends, the hooks at right angles to the plane of the V. These wires are hooked through the holes in the sides of the casings with the points outward and the ends bent down and around the base wire. This will give six retaining wire loops on a side, spaced to come opposite each other and in line with the six alternate spokes of the wheel.

Rawhide straps $\frac{1}{2}$ in. wide and 15 in. long are used to hold the protector on, each strap passing through the V-shaped wire loops on either side of the wheel and on both sides of the spokes. These six straps are drawn moderately tight before the tire is pumped up, and when inflated the protector should fit quite snugly all around. The wires on both sides serve not only to hold the protector in place, but they protect the shoe from side wear in ruts, says a correspondent of Automobile. The tread will not wear off as fast as the tread of an ordinary tire, because it is not under similar tension, the surface yielding somewhat to any tearing action of the road impediments, instead of being gouged out. If the protectors are only placed on the front wheels they will save the wear on the rear tires almost as much as though they were covered. This is due to the increased size of the front tires, which make a pathway for the rear wheels.



Auto Tire Protector

A cement that will resist white heat may be made of pulverized fire-clay, 4 parts; plumbago, 1 part; iron filings or borings free from oxide, 2 parts; peroxide manganese, 1 part; borax, $\frac{1}{2}$ part, and sea salt, $\frac{1}{2}$ part, says Power. Mix these to a thick paste, and use immediately, heating gradually when first using.

Amateur Mechanics

HOW TO MAKE LANTERN SLIDES

The popularity of lantern slides, and especially of the colored ones, as a means of illustrating songs, has caused so large a demand for this class of work that almost any amateur may take up slide-making at a good profit. The lantern slide is a glass plate, coated with slow and extremely fine grained emulsion. The size is 3¼ by 4 in. A lantern slide is merely a print on a glass plate instead of on paper.

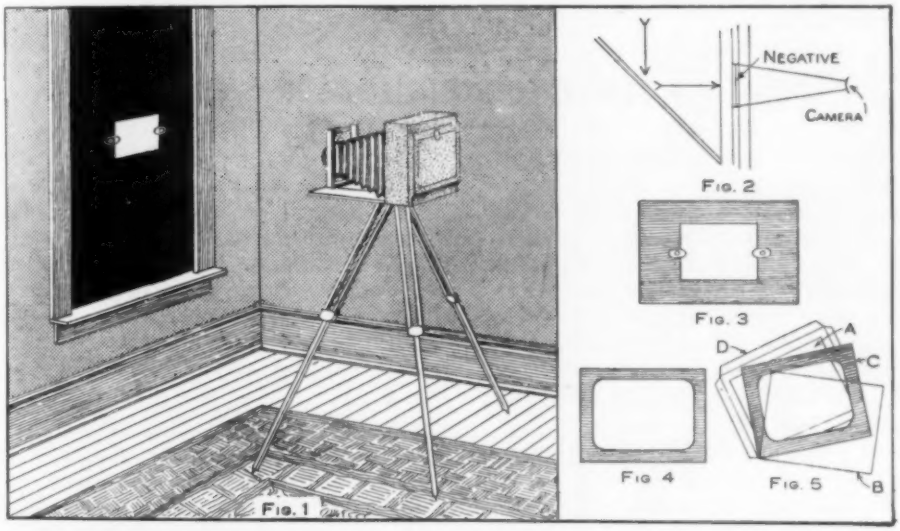


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Lantern slides can be made in two different ways. One is by contact, exactly the same as a print is made on paper, and the other by reduction in the camera. In making slides by contact, select the negative and place it in the printing frame and put the lantern plate upon it, film to film. Clamp down the back and expose the same as for making a print. A good method for exposing is to hold a lighted match about 3 in. from the frame for three or more seconds according to the density.

Development is carried on the same as with a negative. The image should appear in about a minute, and development should be over in three or four minutes. If the exposure has been correct, the high lights will stay white throughout the development and will come out clear glass after fixing. It is best to use the developers recommended by the manufacturer of the plates you are using and you will find the formulas in each package of plates. It is best to use a plain fixing bath, which must be fresh and kept as cool as possible in hot weather.

When the negative is larger than the lantern slide plate, and it is desirable to reduce the entire view upon the slide, a little extra work will be necessary. Select a room with one window, if possible, and fit a light-proof frame into it to keep out all light with the exception of a hole in which to place the negative as shown in Fig. 1. Unless this hole is on a line with the sky it will be necessary to place a large sheet of white cardboard at an

angle of 45 deg. on the outside of the frame to reflect the light through the negative as shown in Fig. 2. Make or secure an inside kit to place in the plate holder of your camera to hold the lantern slide plate as shown in Fig. 3. Draw lines with a pencil, outlining on the ground glass of the camera the size of the lantern slide plate, and in the place where the plate will be in the plate holder when placed in position in the camera. This will enable you to focus to the proper size. Place the camera in front of the hole in the frame, place the negative in the hole and focus the camera for the lantern slide size. Expose with a medium stop for about 20 seconds and treat the plate the same as with the contact exposure.

When dry the lantern slide plate may be tinted any color by means of liquid colors. These can be purchased from any photo material store. In coloring the slide plate it is only necessary to moisten the gelatine film from time to time with a piece of cloth dampened in water. The colors may then be spread evenly with a soft brush, which should be kept in motion to prevent spots.

The slide is put together by placing a mat made of black paper, as shown in Fig. 4, on the gelatine side of the lantern slide, A, Fig. 5, and then a plain glass, B, over the mat, C, and the three bound together with passe-partout tape, D. Contrasty negatives make the best slides, but the lantern slide plate should be made without any attempt to gain density.

HOW TO MAKE A PORCH SWING CHAIR

The material needed for making this porch swing chair are two pieces of round wood 2½ in. in diameter and 20 in. long, and two pieces 1¼ in. in diameter and 40 in. long. These longer pieces can be made square, but for appearance it is best to have them round or square with the corners rounded. A piece of canvas, or other stout cloth, 16 in. wide and 50 in. long, is to be used for the seat. The two short pieces of wood are used for the ends of the chair and two 1-in. holes are bored in each end of them 1½ in. from the ends, and between the holes and the ends grooves are cut around them to make a place to fasten ropes, as shown at B, Fig. 1. The two longer pieces are used for the sides and a tenon is cut on each end of them to fit in the 1-in. holes bored in the end pieces, as shown at A, Fig. 1. The canvas is now tacked on the end pieces and the pieces given one turn before placing the mortising together.

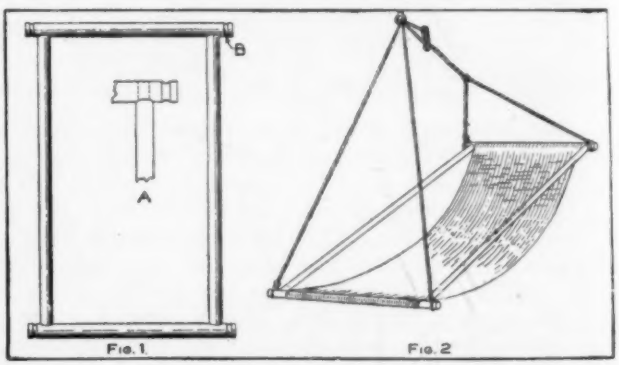


Fig. 1 Fig. 2

The chair is now hung up to the porch ceiling with ropes attached to a large screw eye or hook. The end of the chair to be used for the lower part is held about 16 in. from the floor with ropes direct from the grooves in the end pieces to the hook. The upper end is supported by using a rope in the form of a loop or bail, as shown in Fig. 2. The middle of the loop or bail should be about 15 in. from the end piece of the chair. Another rope is attached to the loop and through the hook and to a slide as shown. This will allow for adjustment to make the

device into a chair or a hammock.—Contributed by Earl R. Hastings, Corinth, Vt.

How to Find the Blind Spot in the Eye

Make a small black circular dot ½ in. in diameter on a piece of cardboard and about 3 in. from the center of this dot draw a star. Hold the cardboard so that the star will be directly in front of one eye, while the dot will

FIG. 2

be in front of the other. If the star is in front of the left eye, close the right eye and look steadily at the star while you move the cardboard until the point is reached where the dot disappears. This will prove the presence of a blind spot in a person's eye. The other eye can be given the same experiment by turning the cardboard end for end. The blind spot does not indicate diseased eyes, but it simply marks the point where the optic nerve enters the eyeball, which point is not provided with the necessary visual end organs of the sight, known as rods and cones.

A wax from the rafie palm of Madagascar is being used as a substitute for beeswax.

Home-Made Water Wheel Does Family Washing

The accompanying sketch illustrates a very ingenious device which does the family washing, as well as to operate other household machines. A disk 1 in. in thickness and 10 in. in diameter was cut from a piece of rough board, and on its circumference were nailed a number of cup-shaped pieces cut from old tin cans. A hole was then bored through the center of the disk and an old piece of iron rod was driven through to form a shaft. Two holes were then bored opposite each other through the sides of a wooden box in which the disk was placed, allowing the shaft to project through the holes. A small grooved wooden pulley was driven tightly on one of the projecting ends of the shaft. The top of the box was then tightly closed and a hole, large enough to admit the nozzle of a garden hose, was bored so that the jet of water would flow upon the tin buckets that were nailed to the circumference of the wheel or disk. Another hole was bored in the bottom of the box large enough to allow the waste water to run away freely. A belt, made from an ordinary sash cord, was run from the small pulley on the waterwheel to a large pulley, as shown in Fig. 1. A pitman was attached to the large pulley, which operates the washing machine by its reciprocating motion, and the length of the stroke is adjusted by moving the position of the hinge joint on the arm of the washing machine, as shown in Fig. 2. The pressure at the nozzle is about 20 lb. per square inch, and is sufficient to drive the waterwheel under all ordinary circumstances.—Contributed by P. J. O'Gara, Auburn, Cal.

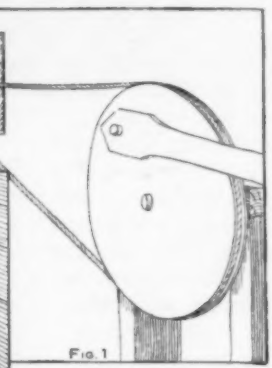
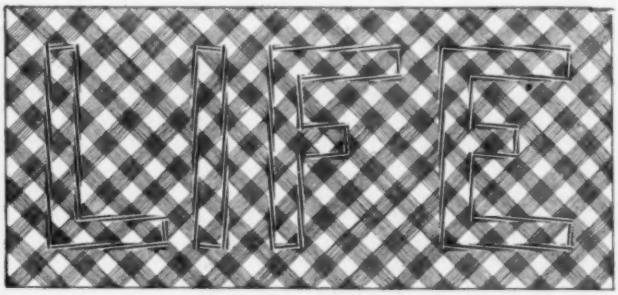


FIG. 1

An Optical Illusion

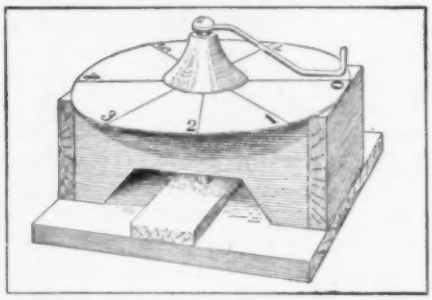
When looking at the accompanying sketch you will say that the letters are alternately inclined to the right and left. They are not so and can be proved by measuring the distance of the top and bottom of any vertical strokes from the edge of the entire block. They will be found to be exactly the same distance. Or take any of the horizontal strokes of the four letters and see how far their extremities are from the top and bottom of the entire block. It will be found that a line joining the extremities of the strokes are strictly parallel to the top or bottom and that they are not on a slant at all. It is the slant of the numerous short lines that go to make up the letter as a whole that deceives the eye.



Home-Made Micrometer

It often becomes necessary to find the thickness of material so thin, or inconvenient to measure, that a rule or other measuring device will not serve the purpose. A simple, fairly accurate, and easily made apparatus of the micrometer form may be constructed as shown by the accompanying sketch. Secure a common iron or brass bolt about ¼-in. in diameter and about 2½ in. long, with as fine a thread as possible, and the thread cut to within a short distance of the head of the bolt. The head of the bolts should have a slot cut for the use of a screwdriver. Clamp together two blocks of wood with square corners which are about 1 in. wide, ¾ in. thick and 2½ in. long and fasten them together with small pieces nailed across the ends. The width of the blocks will then be about 2 in. Bore a ¼-in. hole through the center of the blocks in the 2 in. direction. Remove the clamp and set the nut into one of the blocks, so that the hole will be continuous with the hole in the wood. Cut out a piece from the block combination, leaving it shaped like a bench, and glue the bottoms of the legs to a piece of thin board about 2½ in. square for a support.

Solder one end of a stiff wire that is about 2 in. long to the head of the bolt at right angles to the shaft, and fix a disc of heavy pasteboard with a radius equal to the length of the wire, and with its circumference graduated into equal spaces, to serve in measuring revolutions of the end of the wire, to the top of the bench. Put the bolt in the hole, screwing it through the nut,



and the construction is complete. The base is improved for the measuring work by fastening a small piece of wood on the board between the legs of the bench. A small piece of metal is glued on this piece of wood at the point where the bolt meets it.

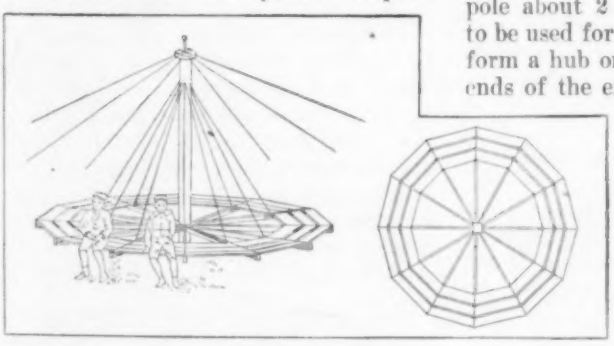
Find the number of threads of the screw to the inch by placing the bolt on a measuring rule, and counting the threads in an inch of its length. The bolt in making one revolution will descend a distance equal to the distance between the threads.

The device is used by placing the object whose thickness is to be measured on the base under the bolt, and screwing the bolt down until its end just touches the object, then removing the object, and screwing the bolt down until its end just touches the base, carefully noting while doing so the distance that the end of the wire moves over the scale. The part of a rotation of the bolt, or the number of rotations with any additional parts of a rotation added, divided by the number of threads to the inch, will be the thickness of the object. Quite accurate measurements may be made with this instrument, says the Scientific American, and in the absence of the expensive micrometer, it serves a very useful purpose.

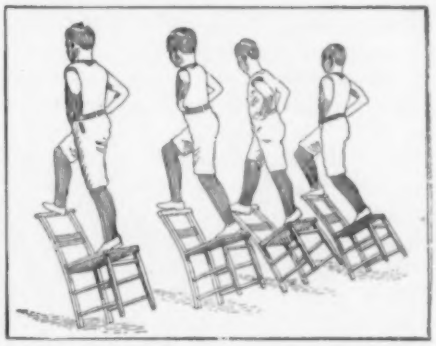
Another Electric Lamp Experiment

Break a portion of the end off from a 16-cp. globe that has been thrown away as useless. Shake the globe until all the filament is broken away, leaving only the ends of the platinum wire exposed. Screw the globe into a socket that sets upright and fill it with salt water. Make one connection to the socket from the positive wire of a 110-volt circuit and the other to a ground. When the current is turned on small stars will be seen in the globe, which show up fine at night.—Contributed by Lindsay McMillan, Santa Maria, Cal.

Two or three applications of milk which are wiped up with a dry cloth will remove india ink spots on carpets.



Side and Top View



Feat of Balancing on Chairs

Among the numerous physical exercises is the feat of balancing on the two rear legs of a chair while one foot rests on the front part of the seat and the other on the back of the chair. This may appear to be a hard thing to do, yet with a little practice it may be accomplished. This exercise is one of many practiced by the boys of a boys' home for an annual display given by them. A dozen of the boys will mount chairs at the same time and keep them in balance at the word of a commanding officer.

How to Make a Merry-Go-Round Swing

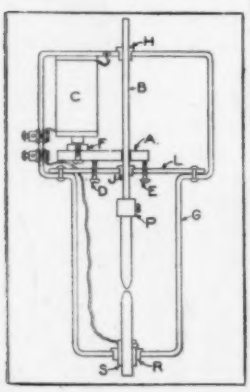
A 6 by 6-in. piece of wood 12 ft. long is used for the center pole. Bore a ¾-in. hole in each end to a depth of 6 in. Place a ¾-in. bolt in each hole, the bolt being long enough to protrude 2 in. beyond the end of the wood. Short pieces of wood are nailed on the center pole about 2 ft. from the end that is to be used for the bottom. This should form a hub on which to place the inner ends of the extending spokes that hold the platform. The spokes are made from twelve pieces of 2 by 4-in. material 12 ft. long.

Usually a wheel can be found in a scrap pile suitable to place on the pin that is in the top end of the center pole. The wheel should be open

or have spokes. This wheel is used to attach wires for guying. The bottom pin in the center pole is placed in a hole that is bored into a block of wood about 12 in. square and 3 or 4 in. thick. A piece of sheet metal should be drilled and placed on the pin between the block and end of the pole to make a smooth bearing. The center pole is now placed in position and guyed with six wires that are about 35 ft. long. Stakes are driven into the ground and the wires fastened to them and to the wheel at the top end of the pole. Care should be taken when attaching the wires to get the center pole to stand perpendicular. Twelve hooks should be placed at equal distances around the center pole about 1 ft. from the top end. Wires are fastened to these hooks and to the twelve 2 by 4-in. pieces used for the spokes. The wires should be tied around each spoke about 2 ft. from the ends. Space the spokes with equal divisions and cover the outer 2 ft. of the ends with boards, as shown in the plan sketch on the right hand end of the drawing. The boards may be nailed or bolted. If bolted and the wires made in a loop at the hooks, the swing can easily be taken apart and changed from one place to another.—Contributed by A. O. Graham, Fort Worth, Tex.

Home-Made Arc Lamp

The frame of the lamp is made from bar metal ¾ in. wide and ⅛ in. thick, bent and welded to make a continuous loop in the shape as shown at G in the sketch. This frame should be about 10½ in. long with the upper or wider part 4 in. long, and the lower part 6½ in. long. The width should be about 5¼ in. at the top and 4 in. at the bottom. A cross bar, L, made of the same material, is fitted into the off-set in the frame and riveted. Holes are drilled through the frame and brass bushings, H and J, are fitted for bearings to receive the adjusting brass rod, B, which should be ¼ in. in diameter. A brass curtain rod can be used for the rod B, and on its lower end a socket, P, is soldered.



A piece of brass 2 in. long, ½ in. wide and ⅛ in. thick is used for the armature, A, to be operated by the magnet coil, C. The coil, C, is made in the usual manner by wrapping No. 14 cotton-covered magnet wire on a wooden spool that has a soft iron core. The spool is about 2½ in. long. The armature, A, is drilled, making a hole just a little larger than the rod, B, and is adjusted in place by two set screws, D and E. A soft piece of iron, F, is fastened to the opposite end of the armature with a screw, which should be placed directly under the end of the coil's core. This end of the armature may be kept from swinging around by placing it between a U-shaped piece of brass fastened to the cross piece L. At the bottom end of the frame, and directly centering the holes H and J, a hole is drilled to receive a hard rubber bushing, R, for insulating the brass ferrule, S, that holds the lower carbon.

One connection is made from the main to the upper binding-post, which is in turn connected to one terminal of the coil, C, the other coil terminal being attached to the frame. The other main connection is made to the lower binding-post, which is also connected to the brass ferrule, S, by soldering. The two binding-posts are insulated from the frame the same as the ferrule S. When using on a 110-volt circuit there must be some resistance in connection, which may be had by using german silver wire, or a water rheostat heretofore described.—Contributed by Arthur D. Bradley, Randolph, Mass.

The Mexican government has appropriated $25,000,000 for irrigation work.

WIRELESS TELEPHONY OPERATING ON GREAT LAKES

By the perfection of wireless telephone instruments in Detroit, Mich., this method of communication has been placed in practical commercial use on the Great Lakes, and every day since July 10, officers and passengers on the new steamer "City of Cleveland" have talked with the Detroit station from as far out as 25 miles. One of the illustrations is a facsimile of the placards placed in different parts of the big lake boat to notify passengers that they can communicate with friends on shore when desired. The boat is also equipped with wireless telegraph, but, as wireless telephony is the latest, it is quite natural that it should be the most in demand. The other illustration shows the inventor of the system at his desk in the Detroit station.

Thos. E. Clark, Inventor, Talking with Lake Steamer 20 Miles Out

It is necessary with the Detroit system as now operated to talk and then listen, instead of being able to talk and listen at the same time, as in using the ordinary telephone. This is done by throwing over a listening key after talking and waiting for the response from the other end. The inventor, however, is working out a method which he believes will make it possible for the user to talk and listen simultaneously. He also claims that it will be possible to transmit speech or relay it from a local wire circuit to a wireless telephone circuit, thus enabling the officers of lake vessels to talk directly with the manager in the head office and passengers to communicate directly with their offices or homes. This, of course, when the vessels are within the wireless telephone zone.

The range of the wireless system depends upon the power used in transmission or the radiation of the waves. This will be increased, it is believed, until the entire area of the Great Lakes will be within the zone of some land station.

The working theory of wireless telephony is to provide means of radiating a stream of electrical waves sufficiently continuous to transmit the higher harmonics on which the quality of the voice depends, and also to provide means for the modifying of this stream of waves in accordance with the sound waves so that the continuously responsive receiver will give indications proportionate to the energy received and be capable of responding with sufficient

This Steamer is Equipped with

Wireless Telegraph-Telephone

Messages sent and received at all points in the United States and Canada from this boat.

Stations in operation at Detroit, Port Huron, Cleveland, Buffalo and Toledo. Other stations now building.

Our rates between this steamer to any of our land stations, 50c. for 10 words and 3c. for each additional word.

For other Line Tolls to points beyond our station, inquire of operator.

Send a message to the folks at home while on the water-way.

Monster freight engines are being installed on the Baltimore & Ohio railroad west of the Allegheny mountains. These big freight handlers are about twice the size of the ordinary engine, but able to pull four times the amount of freight. In order that these big engines could travel over the road safely, certain sections of the roadbed had to be strengthened and several bridges made stronger to bear the extra weight of the engines.

rapidity to the speech harmonics. In the transmission of speech it is necessary to interrupt the continuous oscillation of high-frequency waves at intervals depending upon the character of the sound.

The great field of usefulness for the wireless telephone is, of course, for communicating from one vessel to another. The wireless telegraph apparatus is a great advantage in such communication, but the equipment requires an expert telegraph operator who understands the code, while anyone can use the wireless telephone.

AN AUSTRALIAN SKYSCRAPER

The corner stone of Australia's first real skyscraper, a 9-story building erected at Sidney as a club house by the Commercial Travelers' Association of New South Wales, was laid in May with great rejoicing and enthusiasm. Messages of goodwill and fraternal greeting were received from all parts of New South Wales and from the other Australian states, sent either by delegations or by written and telegraphic communications. The ceremony was performed by Admiral Sir Harry Holdsworth Rawson, governor of the state, assisted by the Premier and many other high officials.

The building will consist of 9 stories with a basement and sub-basement, the whole surmounted by a roof garden affording a fine view of the harbor and city. Its complete cost will total $300,000. The illustration shows the skyscraper as it will appear when completed.

Commercial Travellers' Club